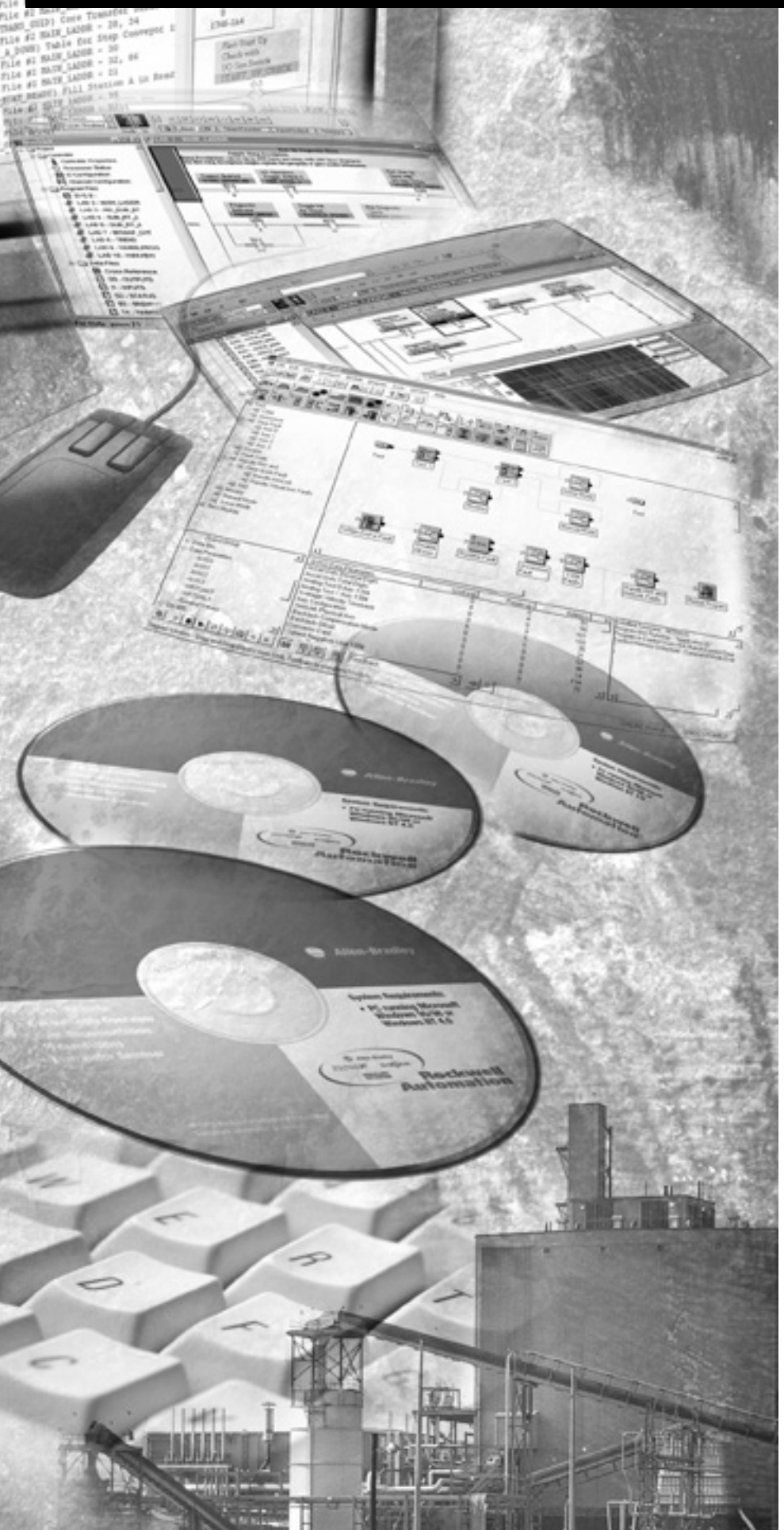


Allen-Bradley

RSFieldbus and the 1757-FFLD Linking Device

1757-FFLD

Programming Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc., is prohibited.

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
SHOCK HAZARD 	Labels may be located on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be located on or inside the equipment (for example, drive or motor) to alert people that surfaces may be dangerous temperatures.

This programmig manual describes how to use the 1757-FFLD linking device along with RSFieldbus in applications with the FOUNDATION Fieldbus network. This document provides technical, network setup and configuration information with guidelines on application function block use. In addition, this manual offers references to third party device configuration guidelines for the Foundation Fieldbus and the linking device. For more information about using Rockwell Automation products with FOUNDATION Fieldbus, see Fieldbus Solutions for Rockwell Automation's Integrated Architecture, publication 1757-UM006.

RSFieldbus is for use with Microsoft Windows 2000 or XP Professional. This manual assumes that you are already familiar with navigating and running applications in a Microsoft Windows 2000 or XP Professional environment.

Conventions Used in This Manual

This manual uses the following conventions:

Convention	Meaning	Example
click	Click left mouse button once. (Assumes cursor is positioned on object or selection.)	Click Browse.
double-click	Click left mouse button twice in quick succession. (Assumes cursor is positioned on object or selection.)	Double-click the H1 icon.
right-click	Click right mouse button once. (Assumes cursor is positioned on object or selection.)	Right-click the Fieldbus Networks icon.
drag and drop	Click and hold the left mouse button on an object, move the cursor to where you want to move the object, and release the mouse button.	Drag and drop the desired block into the Strategy window.
select	Click to highlight a menu item or list choice.	Select H1-1 from the drop-down list.
check/uncheck	Click to activate/deactivate a checkbox.	Check the Do not show this dialog again checkbox.
⇒	Shows nested menu selections as menu name followed by menu selection.	Click File ⇒ Page Setup ⇒ Options.
expand	Click the + to the left of a given item /folder to show its contents.	In the H1-1 window, expand the FFLD.
<Enter>	Keys to be pressed are shown in angle brackets.	Press <Enter>.
>PID Example<	Data to be typed at a prompt or in an entry field.	Enter >PID Example< for the name.

Related Documentation

For information on the Rockwell Software products found in this manual, refer to the following publications:

- RSFieldbus Installation Guide, publication RSFBUS-IN001
- RSFieldbus User Manual, publication RSFBUS-UM001
- RSView Supervisory Edition User's Guide, publication VIEWSE-UM003C

These FOUNDATION Fieldbus Specification documents contain information that you may find helpful as you read this manual:

- System Architecture, publication FF-800
- Technical Overview, publication FD-043
- Application Guide 31.25 kbit/s Wiring and Installation, publication AG-140
- System Engineering Guidelines, publication AG-181

These documents can be purchased from the Fieldbus Foundation as part of the H1 Communications and User Layer Technical Specification.
For more information go to
http://www.fieldbus.org/ProductsAndServices/FFProductCatalog/
and look under Final Specifications.

System Requirements

In This Chapter

Purpose of this Chapter

This chapter describes the components of a typical fieldbus system, including the Rockwell Automation Linking Device, 1757-FFLD.

Refer to the Glossary for further explanation of fieldbus terms and concepts. If you already have a basic understanding of fieldbus concepts, skip to Chapter 2, Setting Up A System, or if you want to start using RSFieldbus for applications immediately, skip to Chapter 4, Applications.

Foundation Fieldbus Description

The term *f*ieldbus refers to an all-digital, two-way communication system that connects control systems to instrumentation.

The Fieldbus Foundation is an organization that developed a fieldbus network standard based on the work and principles of the ISA and IEC. The goal of the Fieldbus Foundation is to provide multi-vendor interoperable process control using a single robust industrial network based on standards and other proven technologies.

FOUNDATION Fieldbus, the communications network created by the Fieldbus Foundation, is a protocol designed for robust, distributed control of process control applications. Devices that you connect within a FOUNDATION Fieldbus network are used for sophisticated, highly distributed Process Control. FOUNDATION Fieldbus is an enabling technology that has been integrated into Rockwell Automation's Integrated Architecture through the linking device.

Hardware Requirements

To build a simple fieldbus system, you need:

- Power supply
- Power conditioner
- Fieldbus cable
- Field devices
- Connector blocks
- Terminal blocks
- Terminators
- 1757- FFLD linking device
- Personal computer

Power Supply

The following power supplies are available according to the referenced Fieldbus Foundation Physical Layer Profile Specification:

Type 131 Non-I.S.	Power supply intended for feeding and I.S. barrier. Output voltage depends on barrier rating.
Type 132 Non-I.S.	Power supply not intended for feeding and I.S. barrier. Output voltage is 32 VDC Max.
Type 133 I.S.	Power supply; complies with recommended I.S. parameters

You can configure power supplies to provide dual redundancy as long as they meet the IEC/ISA Physical Layer Standards requirements. It is not acceptable for example, to merely parallel two power supplies.

A typical power supply for a small network is a SOLA SDN 5-24-100. 5A, 24 VDC output, 110 AC input. For more specifications on power supplies, see the Power Considerations section on page 2-2.

Power Conditioner

A power supply impedance matching network is required for Fieldbus use. This is referred to as a power conditioner. A power conditioner is a

resistive/inductive network that is either external or built into the fieldbus power supply.

Fieldbus Cable

The preferred fieldbus cable is specified in the IEC/ISA Physical Layer Standard, Clause 22.7.2 for conformance testing. It is referred to as type "A" fieldbus cable. This cable will probably be used in new installations.

Other types of cable can also be used. The alternate preferred fieldbus cable is a multiple, twisted pair cable with an overall shield. It is referred to as Type "B" cable. Less preferable types of cable include single or multiple twisted pair cable without any shield, referred to as Type "C" cable, and multiple conductor cable without twisted pairs, but with overall shield, referred to as Type "D" cable.

The following table contains the types of cable identified by the IEC/ISA Physical Layer Standard and their maximum length values. For information about spur wire length, see the Spur Wire Length Calculations section on page 2-9.

Type	Cable Description	Size	Maximum Length
Type A	Shielded, twisted pair	#22 AWG (.8 mm^2)	1900 m (6232 ft.)
Type B	Multi-twisted pair with shield	#22 AWG (.32 mm^2)	1200 m (3936 ft.)
Type C	Multi-twisted pair without shield	#26 AWG (.13 mm^2)	400 m (1312 ft.)
Type D	Multi-core, without twisted pairs and having an overall shield	#16 AWG (1.25 mm^2)	200 m (656 ft.)

Devices

Fieldbus links smart field devices with automation systems. The devices generally used in fieldbus networks are type 113 (bus powered) or type 114 (separate power). Examples of these devices are the Rosemount 3051S pressure Transmitter and the Micro Motion 2700 Flowmeter.

Connector Blocks

Connector blocks are optional coupling devices. They can be used to connect wire to a fieldbus device, or to another section of wire (e.g. at a junction block). Connector blocks are useful for installations where devices may be periodically disconnected or moved.

Standard fieldbus connectors are specified in Annex B of the ISA Physical Layer Standard and Annex A of the IEC Physical Layer Standard.

1757-FFLD Linking Device

The 1757-FFLD, also referred to as the linking device, bridges both FOUNDATION Fieldbus™ HSE and Ethernet/IP networks to FOUNDATION fieldbus H1 device networks. Bridging these networks facilitates information flow between a Logix system's control layers.

Terminal Blocks

Terminal blocks typically provide multiple bus connections, so a device can be wired to any set of bus terminals. They can be the same terminal blocks as used for 4-20 mA.

Terminators

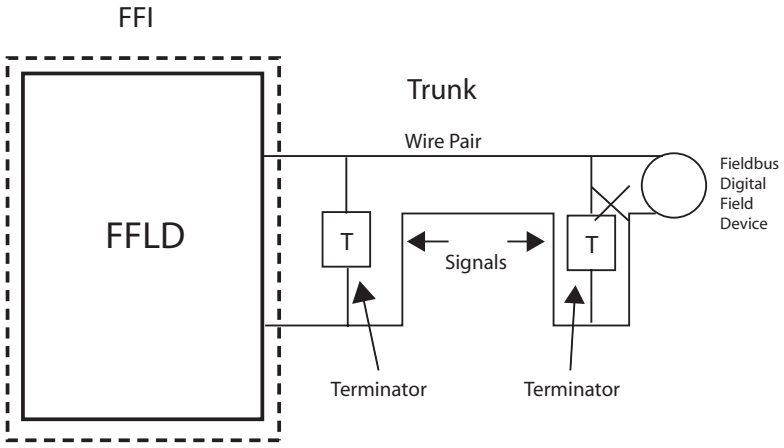
A terminator is an impedance matching module used at or near each end of a transmission line. Terminators prevent distortion and signal loss, and are typically purchased and installed as preassembled, sealed modules. Each terminator has a value of 50 ohms.

ATTENTION

You can use a maximum of two terminators per bus segment.

A trunk is the longest cable path between any two devices on the network. All connections to the trunk are called spurs. Place the terminators at the ends of

the trunk. The following illustration shows a sSimple Fieldbus network with terminators



Personal Computer

You need a computer to run RSFieldbus software.

Software Requirements

RSFieldbus and RSLogix 5000 software for are required. As an option, you can use RSView Supervisory Edition software for specific applications.

Additional Resources

There are a number of resources available should you encounter difficulties with your fieldbus application.

Web Sites

- Rockwell Automation
  - External: http://domino.automation.rockwell.com/applications/gs/region/gtswebst.nsf/pages/Process_Solutions_Home
  - Internal: http://rain.ra.rockwell.com (select **Process Solutions** from the A-Z menu)
- FOUNDATION Fieldbus: http://www.fieldbus.org/
- Tech Support:
  - For Knowledge-base information, go to the Tech support Web site: http://support.rockwellautomation.com/ (select **Knowledge Bases**)
  - For telephone support call: 440-646-5800

Documents

For a list of additional support documentation that may be useful in conjunction with this manual, see the Related Documentation section on page P-2.

Set Up A System

In This Chapter

Purpose of this Chapter

This chapter describes the components of a typical fieldbus system and how to set up and prepare your system for operation.

Refer to the Glossary for further explanation of fieldbus terms and concepts. If you want to start using RSFieldbus for applications immediately, skip to Chapter 4, Applications.

Hardware Requirements

To build a simple fieldbus system, you need:

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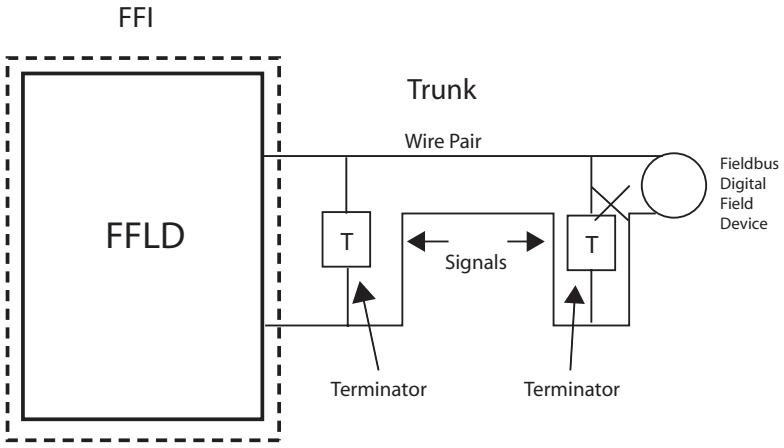


Personal Computer

You need a computer to run RSFieldbus software.

Software Requirements

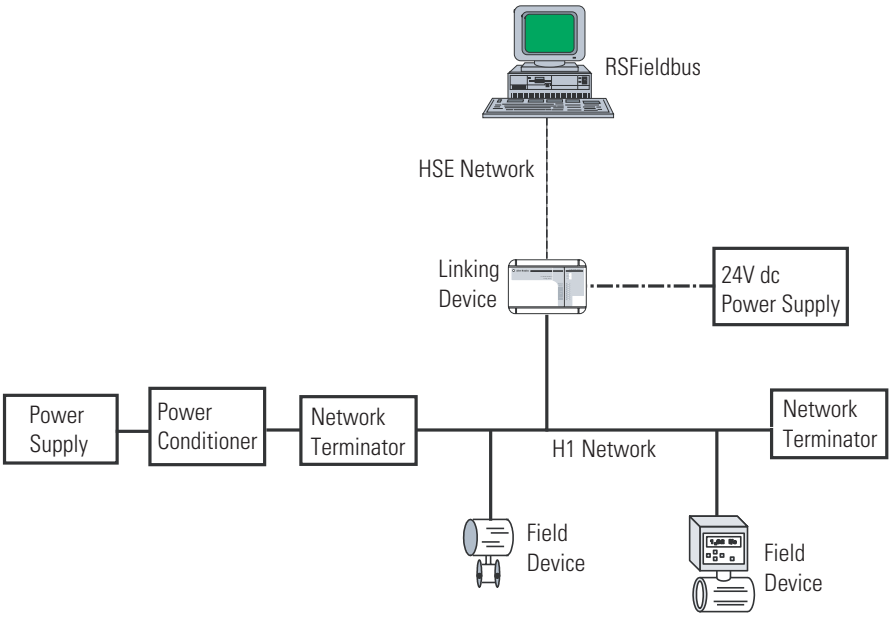
RSFieldbus and RSLogix 5000 software for are required. As an option, you can use RSView Supervisory Edition software for specific applications.

Set Up A System

When setting up a fieldbus system, you must first install and configure your software and all fieldbus devices.

The following figure is a simplified diagram of a fieldbus system using RSFieldbus.

Figure 2.1 Simplified Fieldbus Network HSE



Note the relation of the HSE and H1 levels in the system.

Physical Media

Power Considerations

Fieldbus devices may be either powered from the segment (bus) or locally powered, depending on the design. If at all possible, field devices should be bus powered.

Power Supplies

Power supplies shall comply with IEC 61158-2 criteria and performance requirements, with preferential consideration given to the low-power signal option. We recommend using one power supply dedicated to the linking device and any additional supplies dedicated toward the field devices.

Rockwell Automation manufactures a DIN rail mountable 1794-PS3 supply that is Class 1, DIV2 compliant. It will supply +24VDC at 3 Amps.

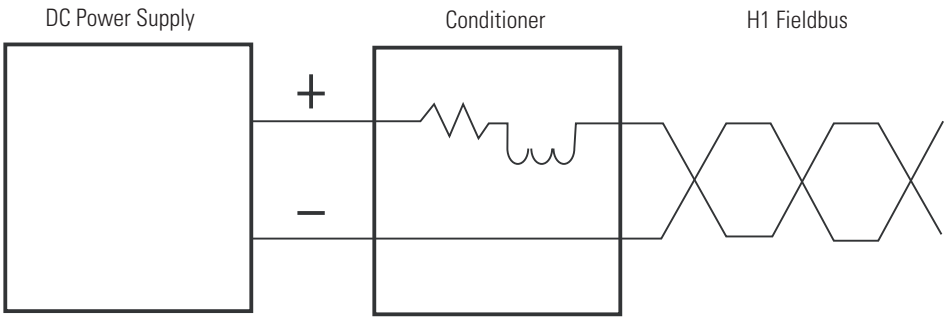
Power Conditioning

If an ordinary power supply were used to power the fieldbus, the power supply would absorb signals on the cable because it would try and maintain a constant voltage level. For this reason, an ordinary power supply must be conditioned for fieldbus use.

Putting an inductor between the power supply and the fieldbus wiring is a way to isolate the fieldbus signal from the low impedance of the bulk supply. The inductor lets in the DC power on the wiring, but it prevents signals from going into the power supply.

One fieldbus power supply conditioner is required for each fieldbus network segment (Figure 2.2).

Figure 2.2 Power Supply With One Power Conditioner



Power conditioners should be redundant units that provide flawless transfer from one unit to another. Primary and secondary sources should be physically separated, not sharing a common backplane or AC source. Be aware that power conditioners have limits on how much current they can source.

Additionally, power conditioners may have an internal terminator which should be considered when placing terminators on the network.

Signal Wire Polarity

The combination signal/power wires have a plus (+) and minus (-) polarity associated to the power conditioner outputs, which must be wired to the appropriate terminals on the devices. Some devices are polarity insensitive, meaning they still work if you connect the positive wire to the negative terminal, and vice-versa.

Grounding

Follow all international, national and local codes for grounding and bonding equipment. Above all, follow the manufacturer's instructions and recommendations for each device installed in a plant.

IMPORTANT Signal wiring of the fieldbus segment cannot be grounded. Grounding out one of the signal wires will shut down an entire fieldbus network.

To prevent ground loops, a Fieldbus segment should only be grounded at one point. This is usually done by grounding the cable shield at the control room end of the segment.

Each process installation has a different requirement for grounding. Be sure that the shield is electrically isolated from the transmitter housing and other grounded fixtures.

Limiting Factors

Bus powered devices usually require 10-30ma of current and between 9-32 volts. The number of bus powered (two-wire) devices on a segment is limited by the following factors:

- Output voltage of the fieldbus power supply
- Current consumption of each device
- Location of the device on the network/segment
- Location of the fieldbus power supply
- Resistance of each section of cable
- Minimum operating voltage of each device

- Additional current consumption due to one spur short-circuit fault (10ma)

The length of a fieldbus wiring system and the number of devices on a network/segment are limited by the power distribution, attenuation, and signal distortion. Refer to ISA 50.02 for the limitations on cable length.

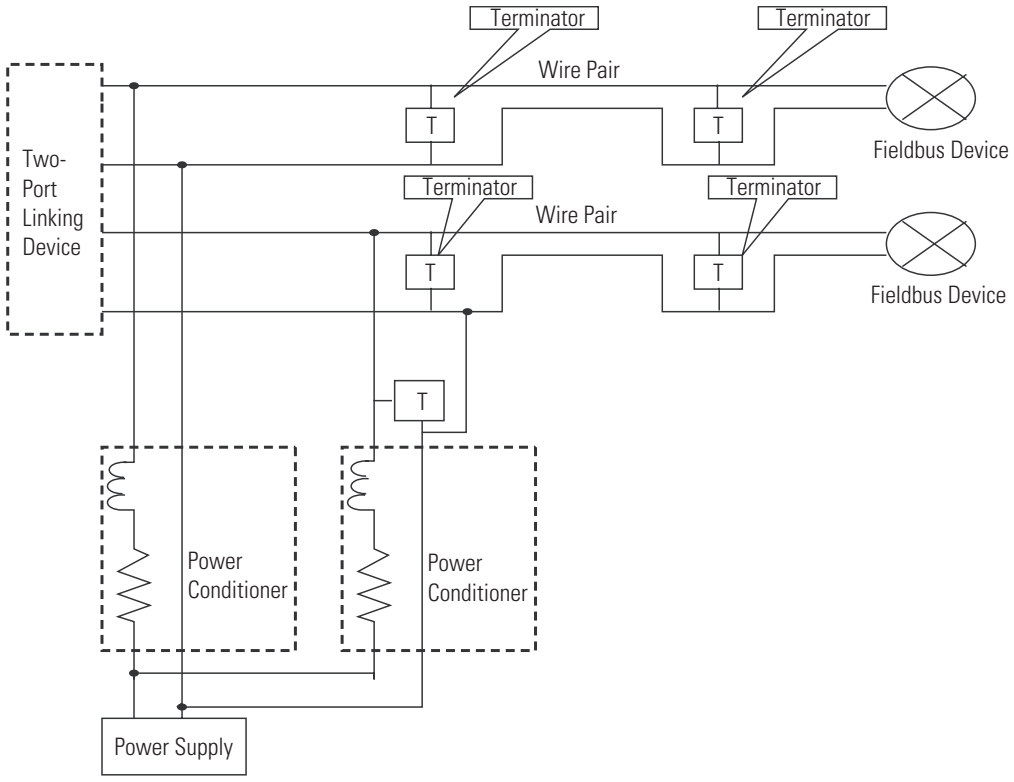
Fieldbus Network Topologies

A network topology refers to the shape and design of a fieldbus network. There are basically three types of network topologies supported: tree; bus with spurs; and daisy chain. The daisy chain network, however, is not recommended.

The two port linking device shown below in Figure 2.3 is an example of a simple fieldbus network on each H1 port. Notice that there are two terminators and one power conditioner per fieldbus segment. The terminators should be placed at the ends of the trunk.

IMPORTANT You can use a maximum of two terminators per bus segment.

Figure 2.3 Rockwell linking device with a Simple Two-Port Fieldbus Network



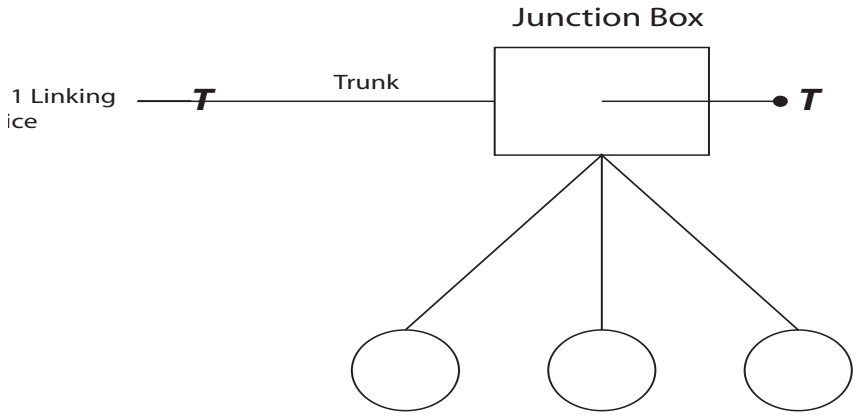
Tree Topology - Chicken Foot

This topology consists of a single fieldbus segment connected to a common junction box to form a network. A tree topology is practical if the devices on the same segment are well separated but in the general area of the junction box. It allows maximum flexibility when configuring and assigning devices to networks/segments, and it is the preferred topology for reuse of existing wiring. (1)

Figure 2.4 is an example of a junction box at the end of a trunk. Remember that a trunk is the longest cable path between any two devices on the network. Since it is at the end of the trunk, the terminator within the junction box is activated. The spurs that are shown on the bottom of the junction box must be taken into consideration using the maximum spur length table (Table 2.1 on page 13).

(1) FF Engineering Guide (6.1.2)

Figure 2.4 Tree Topology (Chicken Foot)



*Note: The ì**T**î is for Terminator.*

Figure 2.5 and Figure 2.6 are examples of chicken foot topologies using Relcom Blocks.

Figure 2.5 Tree Topology (Chicken Foot) Using Relcom Blocks

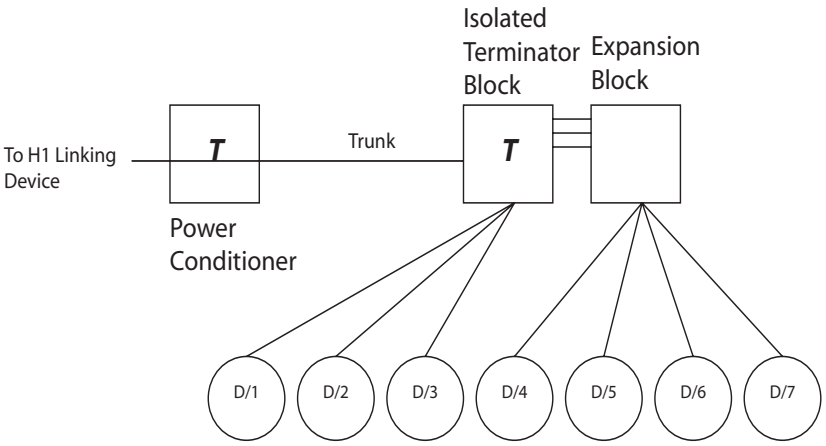


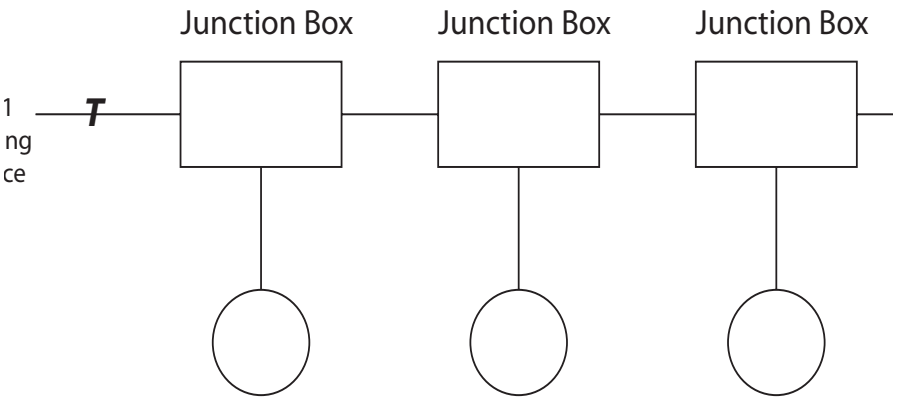
Figure 2.6 Relcom Blocks in a Chicken Foot or Star Fieldbus Topology

Bus With Spurs Topology

This topology consists of fieldbus devices that are connected to a multi-drop bus segment through a length of cable called a spur. A bus with spurs topology is technically acceptable but not generally a good economic choice.

Figure 2.7 below is an example of a bus with spurs topology. Since it is at the end of the trunk, the junction box on the right has its internal terminator enabled.

Figure 2.7 Pepperl + Fuchs F4-JB-I1.CGS FieldConnex Junction Boxes



Spur Wire Length Calculations

Spur lengths can vary from 1 meter to 200 meters. If you have a choice about spur length, the general rule is that the shorter the spur, the better. A spur less than 1 meter is considered a splice. Table 2.1 below lists recommended spur lengths for devices.

Table 2.1 Recommended Maximum Spur Length Table m(ft)

Total Devices	1 Device per Spur	2 Devices Per Spur	3 Devices per Spur	4 Devices per Spur
25-32	1(3)	1(3)	1(3)	1(3)
19-24	30 (98)	1(3)	1(3)	1(3)
15-18	60 (197)	30 (98)	1(3)	1(3)
13-14	90 (295)	60 (197)	30 (98)	1(3)
1-12	120 (394)	90 (295)	60 (197)	30 (98)

Note: These lengths are recommended, not required

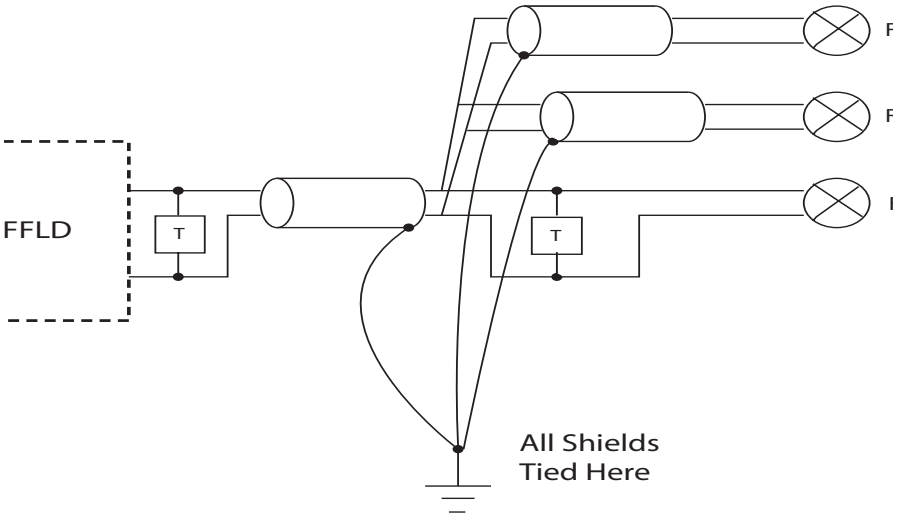
Shielding

For optimal performance, fieldbus cables should be shielded. Common multi-conductor (multi-core) "instrument" cable can be used. It has one or more twisted pairs, an overall metallized shield, and a shield wire.

The instrument shield should be terminated at the host (power conditioner) end of the network in a marshalling cabinet and should not be connected to ground at any other place. If a multiple home run cable goes to a fieldbus junction box, do not attach the cable shield wires from different networks together. This creates ground loops and noise on the network. The most common problems with fieldbus networks are usually due to noise, which can occur if you have the wrong wiring, improper grounding, and/or bad connections.

A cable signal encountering a discontinuity, such as a wire open or short, produces a reflection. The reflection is a form of noise that distorts the original signal. A terminator is used at the ends of a fieldbus cable to prevent a reflection.

Figure 2.8 Proper Shielding for a Tree Network



Signal Quality

When a fieldbus network's signal quality is poor, it can cause intermittent loss of communication to devices, unreasonably long downloads, and lost data. The following components are critical to achieving good signal quality:

- Shielded two wire cable, preferably specifically designed for fieldbus. The type of cable will determine overall length of the trunks and drops.
- Terminators. Terminators reduce noise on segments caused by signal reflections at the end of an open cable. One terminator on each end of the H1 trunk is needed for proper performance.
- Power conditioners are mandatory between a supply and the H1 trunk, which can deliver 9-32 V DC consistently out of the conditioner when under the appropriate load from the cable resistance and while powering the devices. One power supply, or redundant power supplies designed for fieldbus, can be used.
- In areas vulnerable to lightning, lightning arresters should be installed.

The four issues above along with proper shielding and grounding will ensure proper signal qualities.

Protocol Analysis

There are a number of ways in which you can verify that the network you have set up will perform properly. A protocol analyzer is a tool that allows you to test for the content of the message sent, what the messages mean, and what sequence the fieldbus devices talk to each other. It should be noted, however, that a protocol analyzer is an advanced tool with a complex range of functions.

Fieldbus Network Testers

Other testers are used to monitor and characterize network signals. The Relcom Fieldbus Network Monitor (FBT-3) can be used to examine the operation of a live fieldbus network, without interfering with its operation.[1]

The FBT-3 will verify the DC voltage on the network and check how noisy the network is. It can also be used to measure peak noise levels, framing errors, the number of transmitters on the wire, and what the signal level of the weakest field transmitter is. In addition, with the FBT-3 you can see the total number of devices up and running, and what devices are left on the network. The FBT-3 can be purchased from Relcom (www.relcominc.com).

[1] FBT-3 Manual

Another way of testing the signal quality of a network is to use an oscilloscope. We recommend a hand-held battery-operated unit because of its small size and ease of use. The Fluke 199-3 ScopeMeter is one such scope.

Figure 2.9 Fluke 199-3 200MHz ScopeMeter

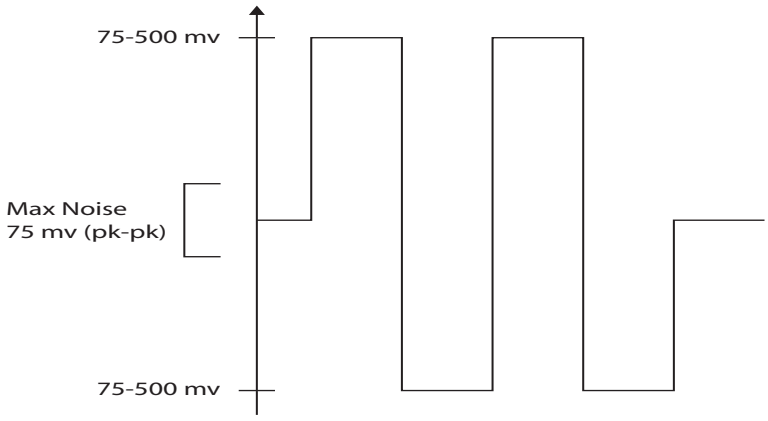
Other scopes that can be used include the TPI-E1505, the Extech-381275 (www.professionalequipment.com), and the Techtronix THS700 Series (www.tek.com).

Signal Analysis

Oscilloscopes, whether portable or stationary, from 50MHz to 1GHz, can be used to capture and examine the waveform. The power supply waveform should be a +/- 0.75 VDC to +/- 1.00 VDC square wave riding on the 9 V DC to 32 V DC steady power supply with < 0.10 V DC ripple. The sharper the rising and falling edges of the waveform, the better the data transfer. The physical media of a system will determine what shape the waveform takes.

The signal is a current modulated ±10mA signal on a 50 test load. This generates a 1.0 Vpp signal. A valid signal can range from 150mVpp up to 1.0Vpp and noise must not exceed 75mvpp (Figure 2.10).

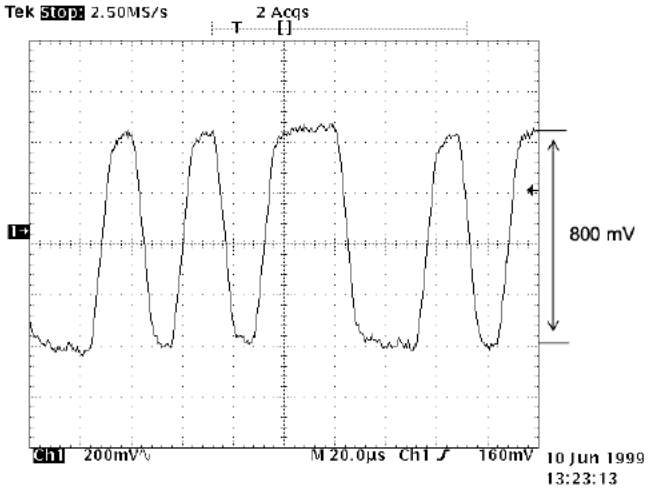
Figure 2.10 An Ideal Fieldbus Communications Signal



Good Network Scope Display

In order to analyze a fieldbus network signal, you must know what constitutes a good signal versus a bad one. Figure 2.11 represents a normal signal consisting of two terminators.

Figure 2.11 Good Network Signal [1]



[1] FF Engineering Guide (11.4.3)

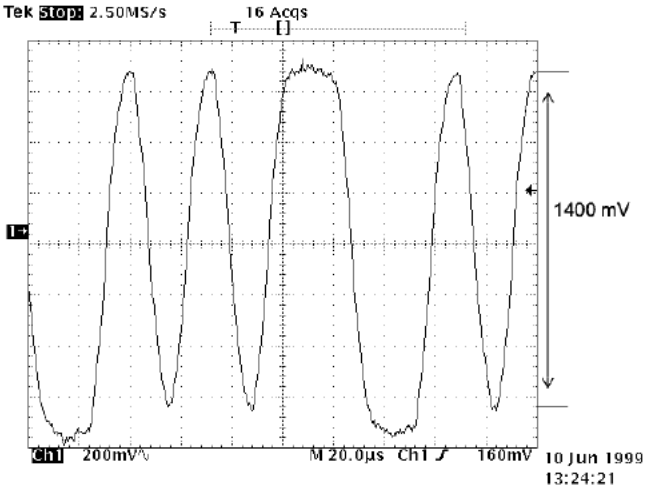
Bad Network Scope Display

Bad network signals can inhibit the performance of your network. A common reason for bad signals is the addition of one or more unnecessary terminators in a network.

WA Remember, there can be only **two** terminators per bus segment.

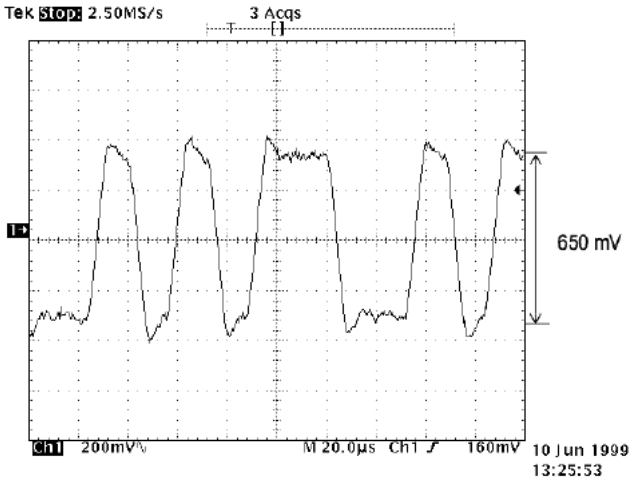
Figure 2.12 shows a bad signal due to only one terminator in a system, while Figure 2.13 shows a bad signal due to one extra terminator (3 total).

Figure 2.12 Bad Network Signal Due to One Terminator(1)



(1)11.4.3 FF Engineering Guide

Figure 2.13 Bad Network Signal Due to Three Terminators[1]



Network Basics

When using the linking device, there are two networks that must be considered: the HSE network and the H1 network.

HSE

HSE stands for High Speed Ethernet. HSE is the Fieldbus Foundation's backbone network running Ethernet and IP. An HSE field device is a fieldbus device connected directly to a High Speed Ethernet (HSE) fieldbus. Typical HSE field devices include HSE linking devices, HSE field devices running function blocks (FBs), and host computers.

IP Addresses

Every device that communicates over the Internet is assigned an IP address that uniquely identifies the device and distinguishes it from other devices on the Internet. An IP address consists of 32 bits, often shown as 4 octets of numbers from 0-255 represented in decimal form instead of binary form.

> For example, the IP address **168.212.226.204** in binary form is **10101000.11010100.11100010.11001100**.

It is easier to remember decimals as opposed to binary numbers, so we use decimals to represent the IP addresses when describing them. However, the

[1]Additional material for ëPhysical Mediaí section taken from FF Engineering Guidelines, Relcom's Fieldbus Wiring and Test Solutions Guide (WWW.Relcominc.com), and Foundation Fieldbus Project Implementation Considerations (Power point Slide by John Yingst at Honeywell)

binary number is important because it will determine which class of network the IP address belongs to.

An IP address consists of two parts, one identifying the network and one identifying the node, or host. The class of the address determines which part belongs to the network address and which part belongs to the node address. All nodes on a given network share the same network prefix, but must have a unique host number.

Class A Network: Binary addresses start with 0, therefore the decimal number can be anywhere from 1 to 126. The first 8 bits (the first octet) identify the network and the remaining 24 bits indicate the host within the network.

An example of a Class A IP address is 102.168.212.226, where "102" identifies the network and "168.212.226" identifies the host on that network.

Class B Network: Binary addresses start with 10, therefore the decimal number can be anywhere from 128 to 191. (The number 127 is reserved for loopback and is used for internal testing on the local machine.) The first 16 bits (the first two octets) identify the network and the remaining 16 bits indicate the host within the network.

An example of a Class B IP address is 168.212.226.204, where "168.212" identifies the network and "226.204" identifies the host on that network.

Class C Network: Binary addresses start with 110, therefore the decimal number can be anywhere from 192 to 223. The first 24 bits (the first three octets) identify the network and the remaining 8 bits indicate the host within the network.

An example of a Class C IP address is 200.168.212.226, where "200.168.212" identifies the network and "226" identifies the host on that network.

Class D Network: Binary addresses start with 1110, therefore the decimal number can be anywhere from 224 to 239.

Class D networks are used to support multicasting.

Class E Network: Binary addresses start with 1111, therefore the decimal number can be anywhere from 240 to 255.

Class E networks are used for experimentation. They have never been documented or utilized in a standard way.

Default Configuration

The default configuration of the linking device is to use DHCP and a BootP server.

The *Dynamic Host Configuration Protocol* (DHCP) is an Internet protocol for automating the configuration of computers that use TCP/IP. DHCP can be used to automatically assign IP addresses, to deliver TCP/IP stack configuration parameters such as the subnet mask and default router, and to provide other configuration information. (1)

The Rockwell BOOTP/DHCP Server (BOOTP) is a standalone program that combines the functionality of standard BOOTP software with DHCP software. The linking device is shipped with BOOTP enabled.

See the linking device Installation Guide for the DHCP/BootP procedure.

Set PC to Correct Subnet

The linking device and the PC Host **must** be on the same sub-net.

If the PC and the linking device are not on the same subnet, a switch is needed to connect the two. Putting them on the same subnet saves this added step.

For example, if the linking device IP address is 192.168.164.99, the PC Host must be 192.168.164.xxx, where xxx is between 1 and 255.

Use RSLinx To Find the IP Address of the linking device

RSLinx is a complete 32-bit product family that links Allen-Bradley networks and devices to Microsoft Windows applications. These range from device programming and configuration applications to HMI applications, such as RSView32, to your own data acquisition applications using Microsoft Office, Web pages, or Visual Basic. RSLinx also incorporates advanced data optimization techniques and contains a set of diagnostics. RSLinx is an OPC Data Access Compliant Server and a DDE server. (2)

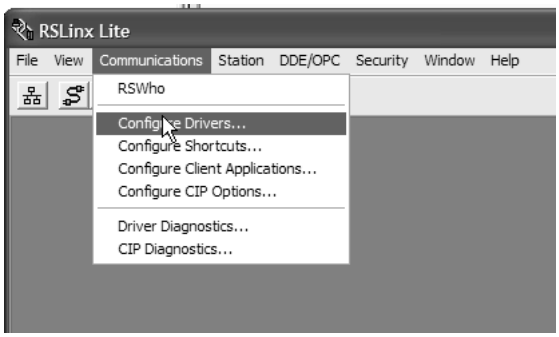
To find the IP address of an linking device that is on the same sub-net as the PC Host using RSLinx:

1. Select **Start** ⇒ **Programs** ⇒ **Rockwell Software** ⇒ **RSLinx** ⇒ **RSLinx**.

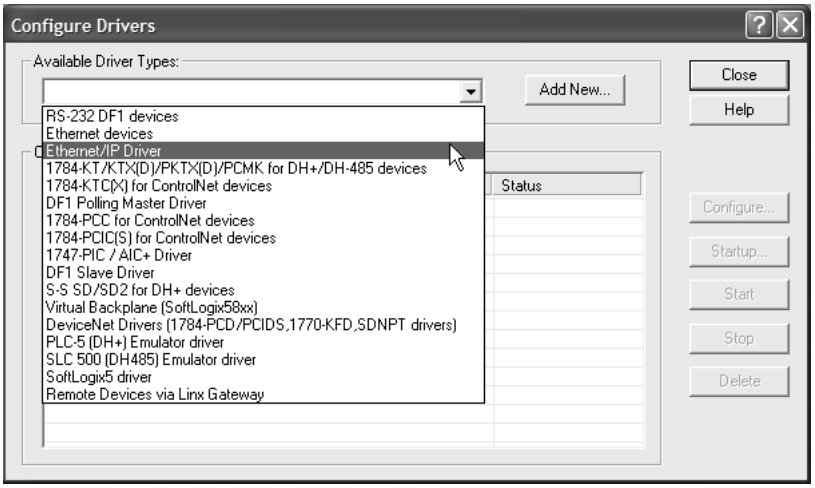
   The **RSLinx** window opens.

(1) dhcp.org
(2) RSLinx help file

2. In the RSLinx window, select **Communications** from the drop-down list and **Configure Drivers** from the menu.

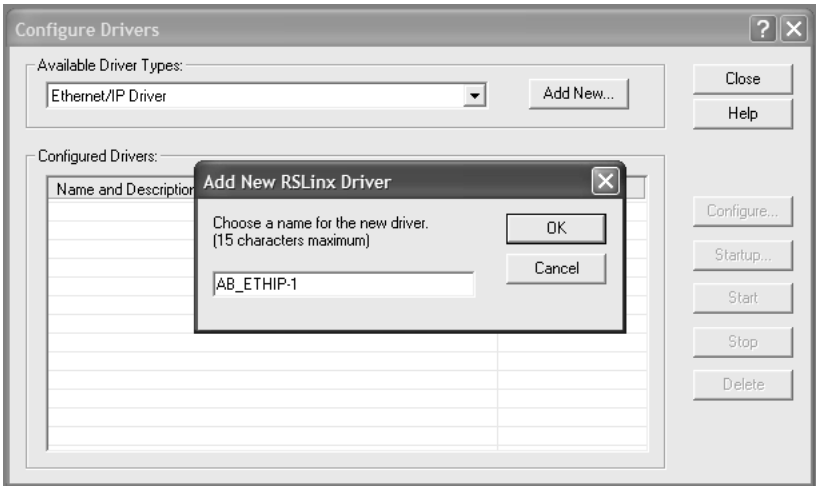


3. Select **Ethernet IP Driver** from the drop-down menu

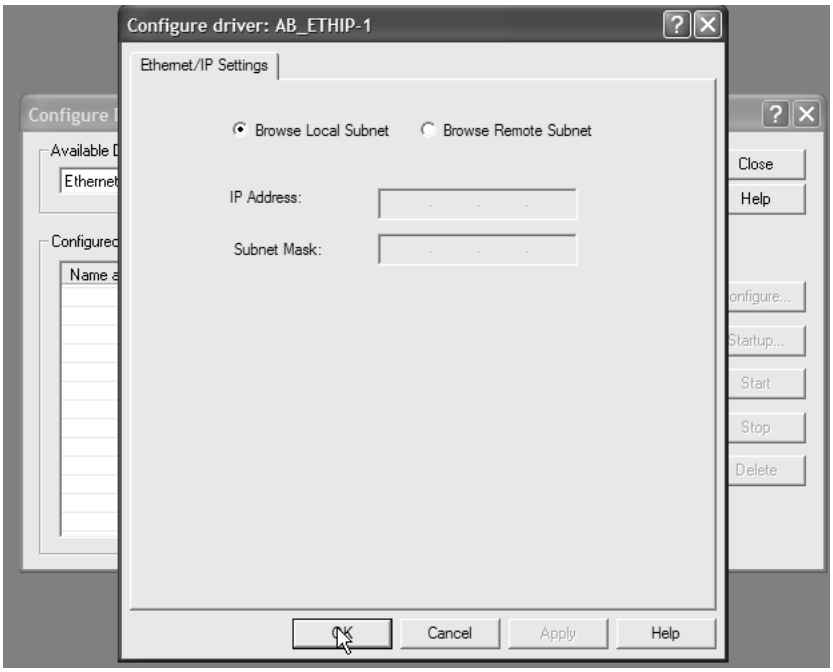


4. Click **Add New**.

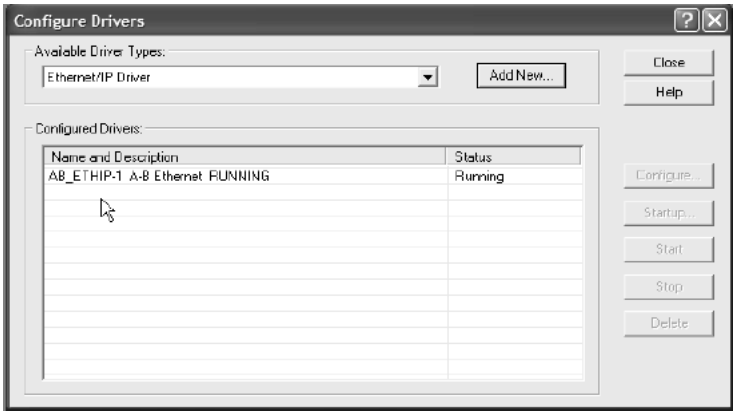
5. Click **OK** (to use the default driver name).



6. Click **OK** to use the default configuration settings as shown.



The AB-ETHIP-1 Driver should show "Running.".



7. Close the configuration window.

8. Select **Communications** from the drop-down list and **RSWho** from the menu.

9. Expand the **AB-EtherIP-1** driver to see the devices on the network.

   In this case, there are two linking devices.

What Do I Do If There's No DHCP?

A possible cause for the lack of a DHCP is a binding socket error, in which another application is already using the DHCP server.

However, it is still best to call RA Tech Support (see page 1-6) if this situation occurs, and for other problems concerning DHCP.

H1

H1 Fieldbus is a digital, serial, multidrop data bus for communication with industrial devices or systems. The Physical Layer provides for transparent transmission of data between Data Link Layer entities across physical connections.

The Physical Layer receives data from the Data Link Layer, adds preamble and delimiters, provides encoding and transmits the resulting physical signals to the wire medium. Signals are then received at one or more other devices and decoded and stripped of preamble and delimiters before being passed to the Data Link Layer of the receiving device(s).

Figure ?.?? shows a physical realization of a simple H1 network using Relcom physical media. Please note that the RelCom FCS-PCT2 incorporates two (2) terminators. The power supply may be any good 24 VDC supply that meets the current requirements for the number of devices. Additional FCS-Es could be added if more devices are added to the network.

Device Addressing

When installing instruments for the first time, it is recommended that each instrument be installed one at a time and that you address the instruments in succession (one after the other). Because like instruments have the same H1 foundation fieldbus address from the factory, you will only be able to see one device. This condition will disable the installer from knowing which device he is actually programming in the plant.

Also, the installer must decide which address to start with for each H1 node. Currently, the linking device (address 10) addresses devices consecutively starting at 18. Other Rockwell Interfaces, like the CN2FF (address 16), starts numbering at 17. The FIM starts numbering at address 18.

Number of Devices per H1 Segment

The specified number of devices per H1 is 32. However, it should be noted that most manufacturers would agree that the actual maximum limit to the number of devices on the H1 is approximately 16. This is due to voltage drop and the physical media that the system uses.

Rockwell Automation feels that the H1's design is optimized by having 6 to 8 devices per H1 network. This optimized limit is mainly due to physical media, the time required for each device to communicate, the extra bandwidth

required to configure the H1 network, and the ability for the network to perform necessary housekeeping.

IMPORTANT Intrinsic safety barriers cause the maximum device number per H1 to change to 4 to 6 devices, depending on the power consumption of the devices installed and the manufacturers' specifications for both the barrier and the transmitter.

Scheduling

Scheduling is done automatically.

The linking device is the LAS when active and running, but each H1 should have at least one Link Master capable device within its network so it can become the backup Link Master/LAS if the linking device is reset or fails to keep the H1 network running.

Getting Devices in the Live List

After the device is connected to an active H1 network, the status of the device in the H1 Live List should be monitored. Instructions for viewing the LiveList can be found in the RSFieldbus User Manual. In addition, the manual explains what to do if the device does not show up in the Live List correctly. For additional troubleshooting tips involving the Live List, see page 5-5.

Device Tags[1]

Device tags are names that you assign to devices. A device tag is assigned to the device when it is commissioned and (for most device states) retains the tag in its memory when it is disconnected. The network address is the current address that the fieldbus is using for the device.

The Fieldbus Foundation uses node addresses in the range 0-255. Each vendor allocates the node numbers in a way that is somewhat unique. They all have reserved low numbers for overhead and host interfaces, and a group above that for live field devices, and some higher numbers for spares.

Addresses used by FF are in accordance with the following ranges:

- 0-15 are reserved.
- 16-247 are available for permanent devices. Some host systems may further subdivide this range. This range is typically shortened for efficiency.

[1] FF Engineering Guide (8.2.1)

- 248-251 are available for devices with no permanent address such as new devices or decommissioned devices.
- 252-255 are available for temporary devices, such as handhelds.

Naming Conventions for Devices

Each FOUNDATION fieldbus device must have a unique physical device tag. The device tag shall be used for the device diagnostic alarm faceplate.

Every FOUNDATION fieldbus has a 32-byte unique identifier, which is a hardware address very similar to MAC addressing and consists of the following:

- 6-byte manufacturer code
- 4-byte device type code
- 22-byte serial number

These identifiers uniquely distinguish the device from all others in the world. The manufacturer code is universally administered by the Fieldbus Foundation, which eliminates the potential for duplication. The device manufacturer assigns the device type code and sequential number. When devices are shipped or configured as spares, this is the default device tag. The FOUNDATION fieldbus device tag shall match the instrument tag Indicated on P&ID.

Things to Consider When Setting Up a System

- For greater reliability, at least one Link Master capable device should be installed on each H1 network as a backup LAS. Please design for this.
- Redundant transmitters should be installed in separate H1 networks, preferably in separate linking devices.
- Each H1 should have a seperate power supply and conditioner.
- Each linking device should have a separate power supply.
- Factory Acceptance Tests (FATs) can be completed on a fieldbus system to verify graphics, database, power, communications, and other system integration features and functions. For more information on FATs, see the System Engineering Guidelines, publication AG-181

Additional Resources

There are a number of resources available should you encounter difficulties with your fieldbus application.

Web Sites

- Rockwell Automation
  - External: http://domino.automation.rockwell.com/applications/gs/region/gtswebst.nsf/pages/Process_Solutions_Home
  - Internal: http://rain.ra.rockwell.com (select **Process Solutions** from the A-Z menu)
- FOUNDATION Fieldbus: http://www.fieldbus.org/
- Tech Support:
  - For Knowledge-base information, go to the Tech support Web site: http://support.rockwellautomation.com/ (select **Knowledge Bases**)
  - For telephone support call: 440-646-5800

Documents

For a list of additional support documentation that may be useful in conjunction with this manual, see the Related Documentation section on page P-2.

Basic Function Blocks

In This Chapter

Purpose of this Chapter

This chapter deals with the basic usage of function blocks within transmitters and the minimum configuration needed to make these transmitters active.

Basic Function Blocks

Basic function blocks are needed to make a transmitter functional and readable within RSFieldbus. These blocks are the Resource Block (RES), Transducer Block (XDCR), Analog Input Block (AI), Analog Output Block (AO), Digital Input Block (DI), and Digital Output Block (DO).

Not all transmitters have these function blocks, but the majority of them do.

Resource Block

The Resource Block is the base block needed in all transmitters before the transmitter can become active. It holds data specific to the transmitter.

The important parameter within the RES is the MODE_BLK. Putting this parameter to AUTO allows the function block to be active upon download.

Transducer Block

The Transducer Block acts as the connection between the physical world of wires and circuit boards to the electronic world of RSFieldbus. The XDCR allows the I/O blocks to access data on the wire and bring it into RSFieldbus to be used for control loops.

The important parameters within the XDCR are MODE_BLK and TERMINAL_NUMBER. Putting the MODE_BLK to AUTO allows the function block to be active upon download.

TERMINAL_NUMBER reflects the physical wiring on a transmitter. Some transmitters have multiple inputs or outputs, so the parameter links the function block to the actual physical wires that have been landed on that terminal.

Input/Output Blocks

The I/O Blocks take the data retrieved from the transducer links and makes it available to RSFieldbus for use.

The important parameters within the I/O blocks are the MODE_BLK and CHANNEL. Putting the MODE_BLK to AUTO allows the function block to be active upon download.

CHANNEL is the I/O block equivalent of the XDCR's TERMINAL_NUMBER. When the CHANNEL parameter is equal to the TERMINAL_NUMBER, data will flow from the physical transmitter wires to the I/O blocks and from the I/O blocks to the transmitter wires, eventually then to the device.

There are several things to keep in mind with regards to function block use. The sheer volume of individual transmitters available makes listing them all virtually impossible. The function blocks discussed here will allow a user to put a device on the wire, access it through RSFieldbus, and retrieve data. The actual use of these and all functions blocks are based on the individual vendor. For answers to more specific questions, refer to your vendor's manual in regards to how best to use these and any other functions blocks.

Put Blocks in Auto

There are a few blocks that need some additional work in order to get them to go into Auto. The Analog Output, Digital Output, APID, Splitter, and Setpoint Generator all have an IMAN status in the MODE_BLK parameter. This status is in response to the parameter BKCAL_ (OUT/IN) being used. It has to do with the handshaking between two blocks that need to be connected before the IMAN can be cleared.

To look at how to clear IMAN from individual blocks, refer to the Function Block Manual, page 1-14.

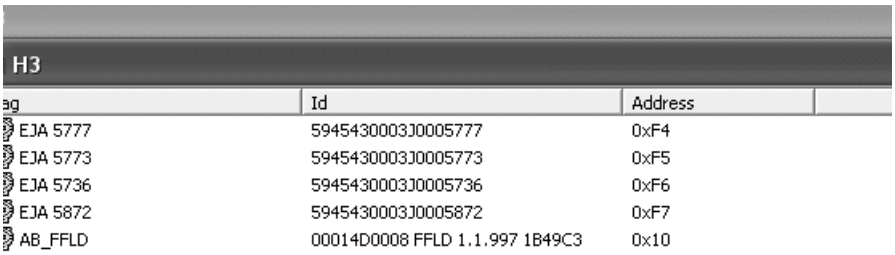
Block Errors

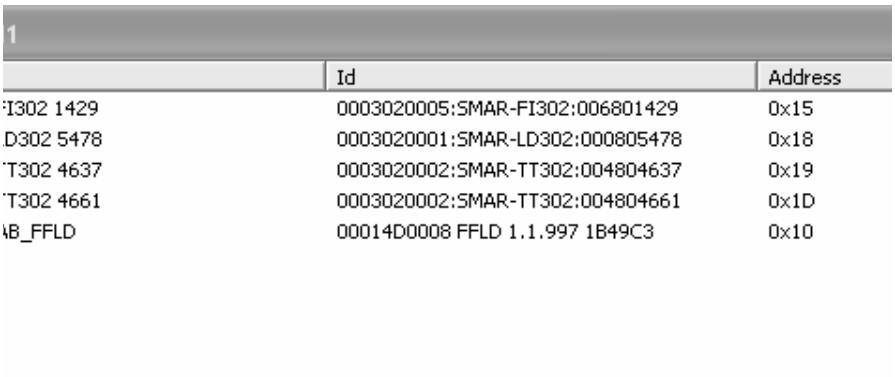
The BLOCK_ERR parameter gives a non-specific reason for the block being in error. The most common errors have to do with a block being Out Of Service. There are various other block-specific reasons for certain blocks to be in error, including ranges being required and logical parameters needing to be set.

To find a specific error given by the BLOCK_ERR parameter, reference the function block in the Function Block Manual, or your specific vendor's manual.

Naming Conventions

When discussing naming conventions, the standard for the facility takes precedence. However, when naming devices on your H1, one should try to incorporate either the device type (temperature transmitter, pressure transmitter) or the serial number of the device within the name.





When a device first comes up on the live list and makes the connection to RSFieldbus, the ID field contains Device Description (DD) information. The specific serial number that is sought is in the last 4 numbers of the string. These numbers are the unique serial number for that device. It is this number that we recommend be incorporated with the tag name somewhere.

Differences Between Configuration and Calibration

Definition of Calibration

Calibration is the process of adjusting certain device parameters in order that the physical quantities measured meet an established standard for accuracy.

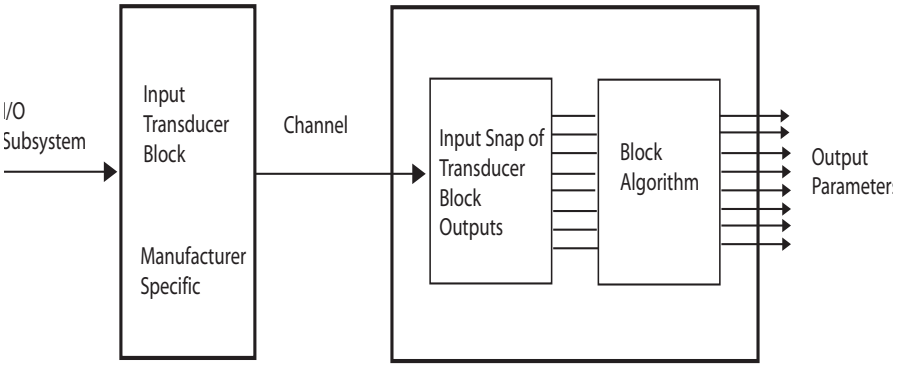
Calibration Parameters in the Transducer Block

Transducer Blocks are used to configure devices. Transducer Blocks decouple Function Blocks from the local input/output functions required to read sensors and command output hardware. They contain information such as calibration data and sensor type. Calibration parameters are located in the Transducer Function Block because the Transducer Function Block is the interface between the physical measuring unit (I/O Subsystem) and the other function blocks.

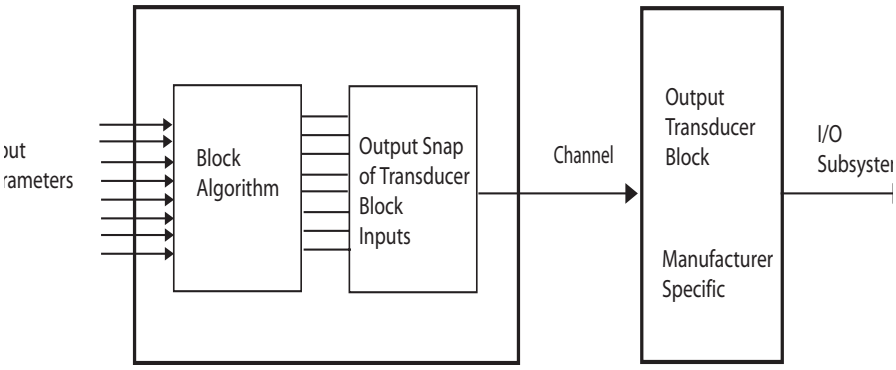
Definition of Configuration?

Configuration is the process of setting parameters in function blocks so that information processed from the I/O Subsystem in the Transducer Block is made available to other function blocks.

Relationship of the Transducer to Other Input Function Blocks



Relationship of Output Function Blocks to the Transducer



Initial Configuration: Virtual Communication Relationships

Virtual Communication Relationships (VCRs) are communication links on an H1 network. A total of 128 VCR's are possible within the linking device, and these VCRs are restricted to 32 per H1 channel. This is further restricted to 16 VCRs going to the Control Logix processor from H1 devices and publishers, and 16 VCRs coming from the Control Logix processor to H1 devices and subscribers.

These restrictions limit the number of inputs and outputs within an H1 line. However, there is no restriction on the type of signals. They can all be analog, all discrete, or a mix of the two. The only restriction is the 16 publisher and 16 subscriber limits.

If the VCR limit is exceeded, a download will still be permitted, although when the download reaches the 17th VCR, a "download failure" will occur. The first 16 VCR's will still be in place, but the 17th will not exist.

VCR Classes

The Foundation Fieldbus specification Fieldbus Access Sublayer (FF-875-1.4) defines three classes of Virtual Communication Relationships that are possible for communications with an H1 field device. These classes are:

- BNU: Buffered Network-Scheduled Unidirectional
- QUU: Queued User-triggered Unidirectional

- QUB: Queued User-triggered Bidirectional

Table 3.1 : VCR Classes

	BNU	QUU	QUB
Permitted Roles	Publisher, Subscriber	Source, Sink	Client, Server, Peer
Conveyance Paths	1	1	2
Conveyance Policy	Buffered	Queued	Queued
Transmission Policy	Network Scheduled	User Triggered	User Triggered

The quantity of each class of VCR that is available for configuration and communication is device dependent. The quantities are specified in the DD files, which are provided with each device. An example of the quantities defined in a DD file, specifically the *.cff file, is shown below.

// From VcrListCharacterisitcs

MaxEntries	= 44	
NumPermanentEntries	= 44	
DynamicsSupportedFlag	= FALSE	//Rev 1.5
StatisticsSupported	= 0x0	//Rev 1.5
MaximumNumberOfClientVcrs	= 0	
MaximumNumberOfServerVcrs	= 5	
MaximumNumberOfSourceVcrs	= 8	
MaximumNumberOfSinkVcrs	= 0	
MaximumNumberOfPublisherVcrs	= 19	
MaximumNumberOfSubscriberVcrs	= 12	

As can be seen, the quantities are broken into sub-categories depending on usage. The above example states that the device can have more publisher BNU than subscriber BNU. Additionally, the device has no client QUB VCR, but it has the ability to serve 8 server QUB VCR. Currently, these limits manifest themselves in either download or communication errors when they are exceeded.

There is also a nuance to the quantities that need to be emphasized with regard to linking devices. The 1757-FFLD *.cff file is used below as an example.

// From VcrListCharacterisitcs

MaxEntries	= 44	
NumPermanentEntries	= 44	
DynamicsSupportedFlag	= FALSE	//Rev 1.5
StatisticsSupported	= 0x0	//Rev 1.5
MaximumNumberOfClientVcrs	= 0	

MaximumNumberOfServerVcrs	= 5
MaximumNumberOfSourceVcrs	= 8
MaximumNumberOfSinkVcrs	= 0
MaximumNumberOfPublisherVcrs	= 64
MaximumNumberOfSubscriberVcrs	= 64

The user would be under the impression that there are 64 publishers and 64 subscribers available. This is both correct and incorrect at the same time. The user can correctly use the total quantity, but it must be evenly distributed among the four H1 channels that the linking device uses. In other words, each channel owns 16 publishers and 16 subscribers. The 16 publishers and 16 subscribers are dedicated to each channel; they cannot be shared if not used by one particular channel.

BNU Class

The BNU class is defined as scheduled. It occurs on a synchronous basis within the macrocycle schedule. During the scheduled portion of Foundation Fieldbus communications, when the devices receive the Compel Data token, this is the class of communication that occurs. The BNU VCR is part of the function block strategy that transfers data from one function block to another.

This class can be further defined as the link between function blocks. More specifically, the BNU VCR is the unique link between function blocks in different devices. Links between function blocks within a device do not use a BNU VCR. Also, links that are used multiple times, or fanned out, between the same devices are not considered unique.

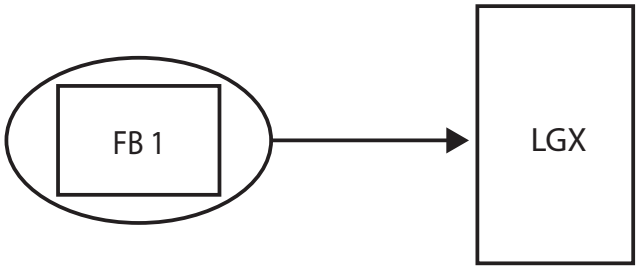
The BNU VCR is also defined as to whether it is a publisher or a subscriber. Therefore, the use of a VCR relative to a device is very important. The connection of the link from one function block to another in a different device will be counted based on its point of origin. The originating device will consume a publisher VCR, whereas the receiving device will consume a subscriber VCR.

Examples of the BNU VCR counting are provided to emphasize the above statements:

1. Linking Device: 1 Subscriber

   Device 1: 1 Publisher

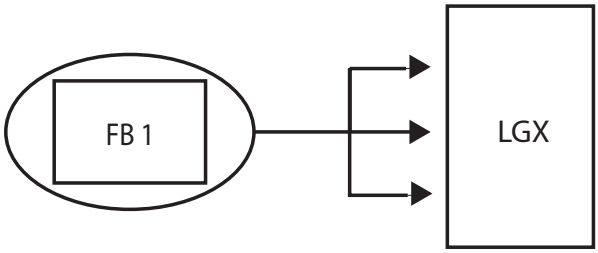
VCRs: 2 total; 1 Publisher, 1 Subscriber



2. Linking Device: 1 Subscriber

   Device 1: 1 Publisher

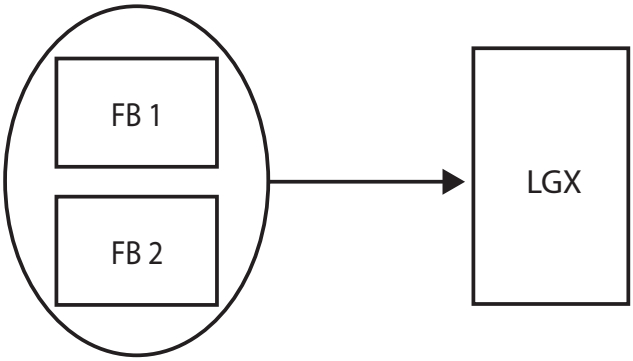
   VCRs: 2 total; 1 Publisher, 1 Subscriber



3. Linking Device: 2 Subscribers

   Device 1: 2 Publishers

   VCRs: 4 total; 2 Publishers, 2 Subscribers

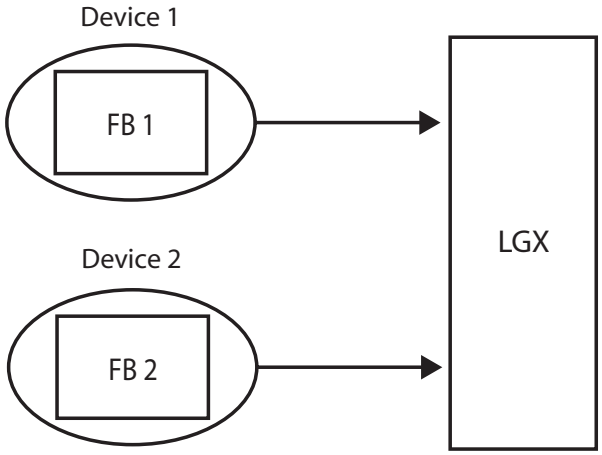


4. Linking Device: 2 Subscribers

   Device 1: 1 Publisher

Device 2: 1 Publisher

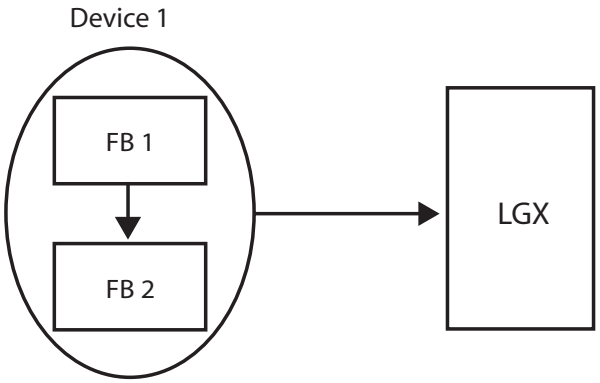
VCRs: 2 total; 2 Publisher, 2 Subscriber



5. Linking Device: 1 Subscriber

   Device 1: 1 Publisher (Internal Links use link objects rather than VCRs)

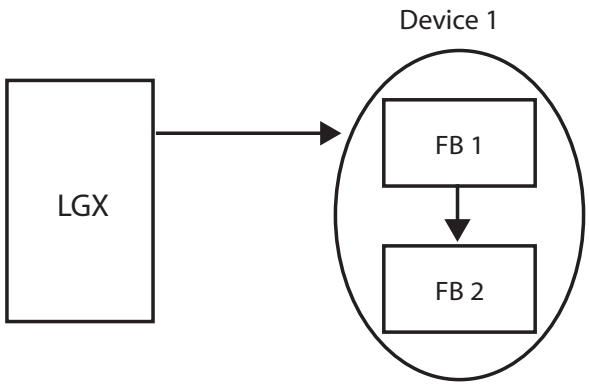
   VCRs: 2 total; 1 Publisher, 1 Subscriber



6. Linking Device: 1 Publisher

   Device 1: 1 Subscriber

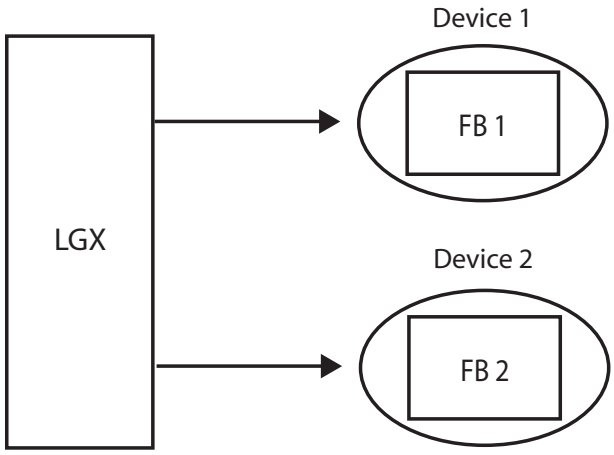
VCRs: 2 total; 1 Publisher, 1 Subscriber



7. Linking Device: 2 Publishers (assuming two links are different LGX outputs)

Device 1: 2 Subscribers

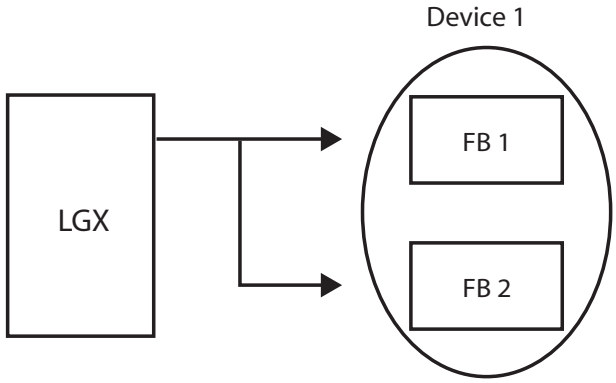
VCRs: 2 total; 1 Publisher, 1 Subscriber



8. Linking Device: 1 Publisher

Device 1: 1 Subscriber

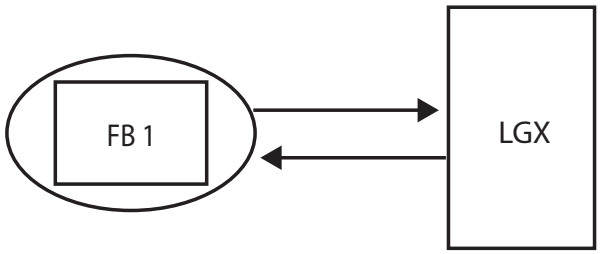
VCRs: 2 total; 1 Publisher, 1 Subscriber



9. Linking Device: 1 Publisher & 1 Subscriber

Device 1: 1 Publisher & 1 Subscriber

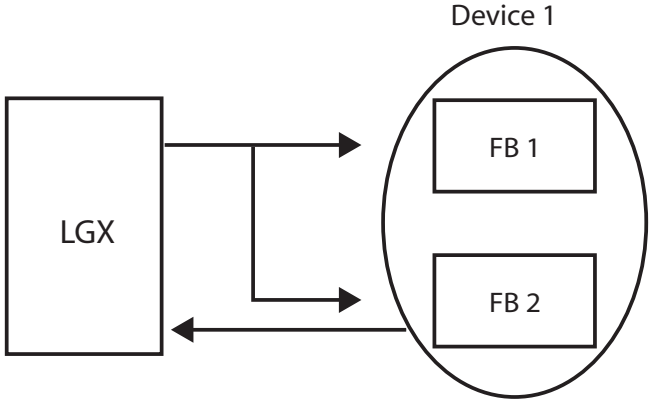
VCRs: 4 total; 2 Publisher, 2 Subscriber



10. Linking Device: 1 Publisher & 1 Subscriber

Device 1: 1 Publisher & 1 Subscriber

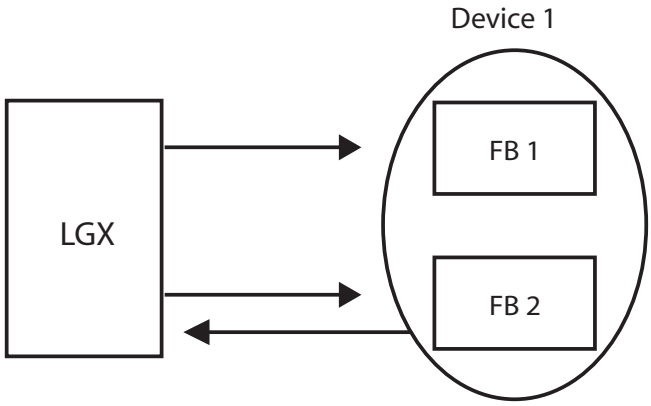
VCRs: 4 total; 2 Publisher, 2 Subscriber



11. Linking Device: 2 Publishers & 1 Subscriber

Device 1: 1 Publisher & 2 Subscribers

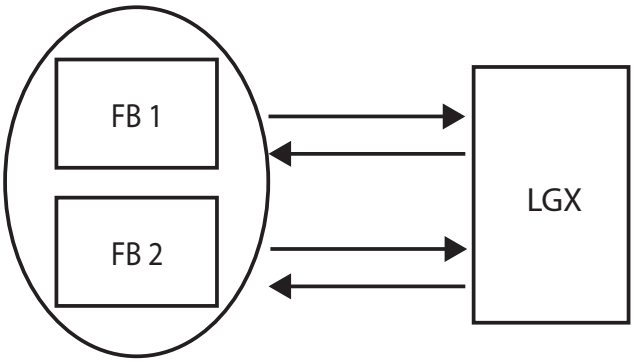
VCRs: 6 total; 3 Publisher, 3 Subscriber



12. Linking Device: 2 Publishers & 2 Subscribers

Device 1: 2 Publishers & 2 Subscribers

VCRs: 8 total; 4 Publisher, 4 Subscriber

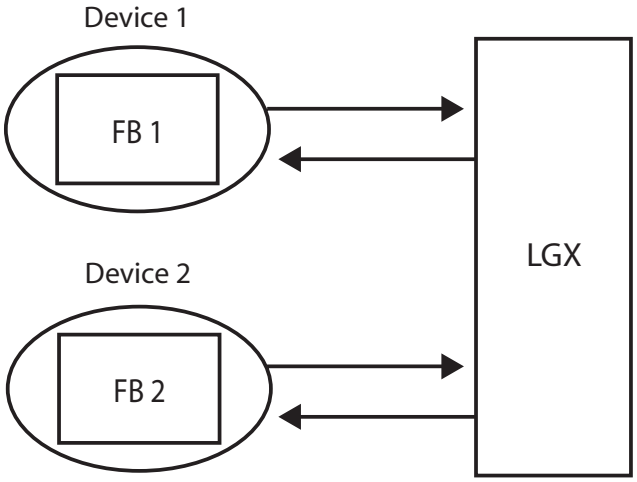


13. Linking Device: 2 Publishers & 2 Subscribers

Device 1: 1 Publisher & 1 Subscriber

Device 2: 1 Publisher & 1 Subscriber

VCRs: 8 total; 4 Publisher, 4 Subscriber



14. Linking Device: 2 Publishers & 2 Subscribers

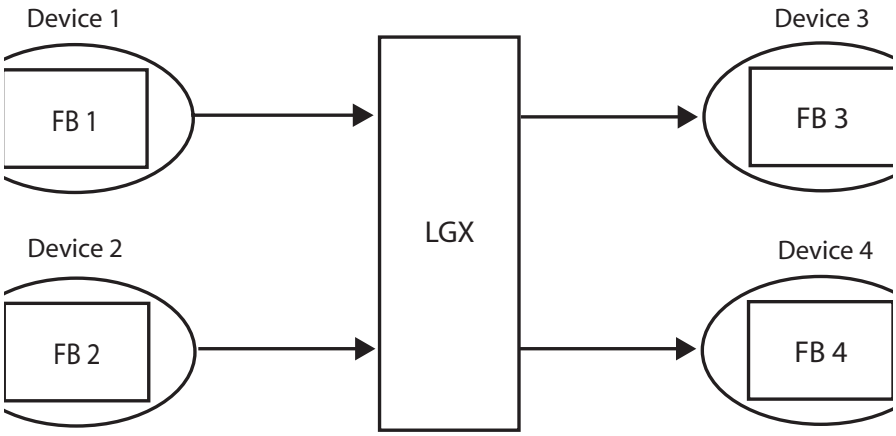
Device 1: 1 Publisher

Device 2: 1 Publisher

Device 3: 1 Subscriber

Device 4: 1 Subscriber

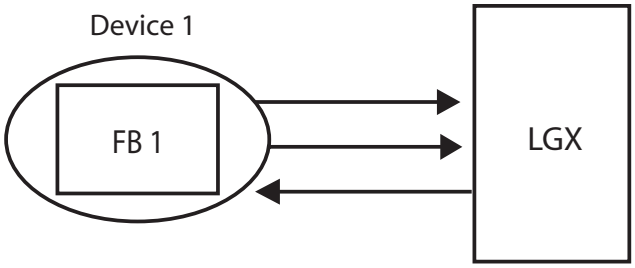
VCRs: 8 total; 4 Publisher, 4 Subscriber



15. Linking Device: 2 Subscribers & 1 Publisher

Device 1: 1 Subscriber & 2 Publishers

VCRs: 6 total; 3 Publisher, 3 Subscriber



QUU and QUB VCR Classes

The QUU and QUB VCR classes are defined as user triggered. During the unscheduled portion of Foundation Fieldbus communications, these are the class of communication that occur when the available time is sensed by the devices. QUU and QUB communications take place when the Link Active Scheduler passes the token to the devices, allowing them to communicate.

The QUU class can be defined as the reporting link with function blocks. Specifically, the QUU VCR is used to report contained parameter values in function blocks such as alarms and change of state. HMI information such as alarm conditions and device calibration data uses this type of configuration with an existing strategy.

The QUB class can be defined as the command link with function blocks. More specifically, the QUB VCR is used to change contained parameter values in function blocks such as MODE or Set Point. HMI interaction via a faceplate or a configuration tool uses this type of communication with an existing strategy.

Since the QUU and QUB VCR use the asynchronous portion of the macrocycle, enough time must be made available. The focus during configuration is to make the macrocycle as small as possible to allow function block execution to occur quickly. Minimizing the asynchronous portion of the macrocycle will adversely affect QUU and QUB VCR from taking place, since that time must also be used for housekeeping activities such as probe nodes.

If there is an expectation of increased communication with devices, either from a control or HMI monitoring standpoint, then the macrocycle should be increased. This is to be done with the understanding that the function block cycle time will be increased as a consequence. Therefore, judicious choice of macrocycle times must be exercised to allow effective QUU and QUB communications.

Applications

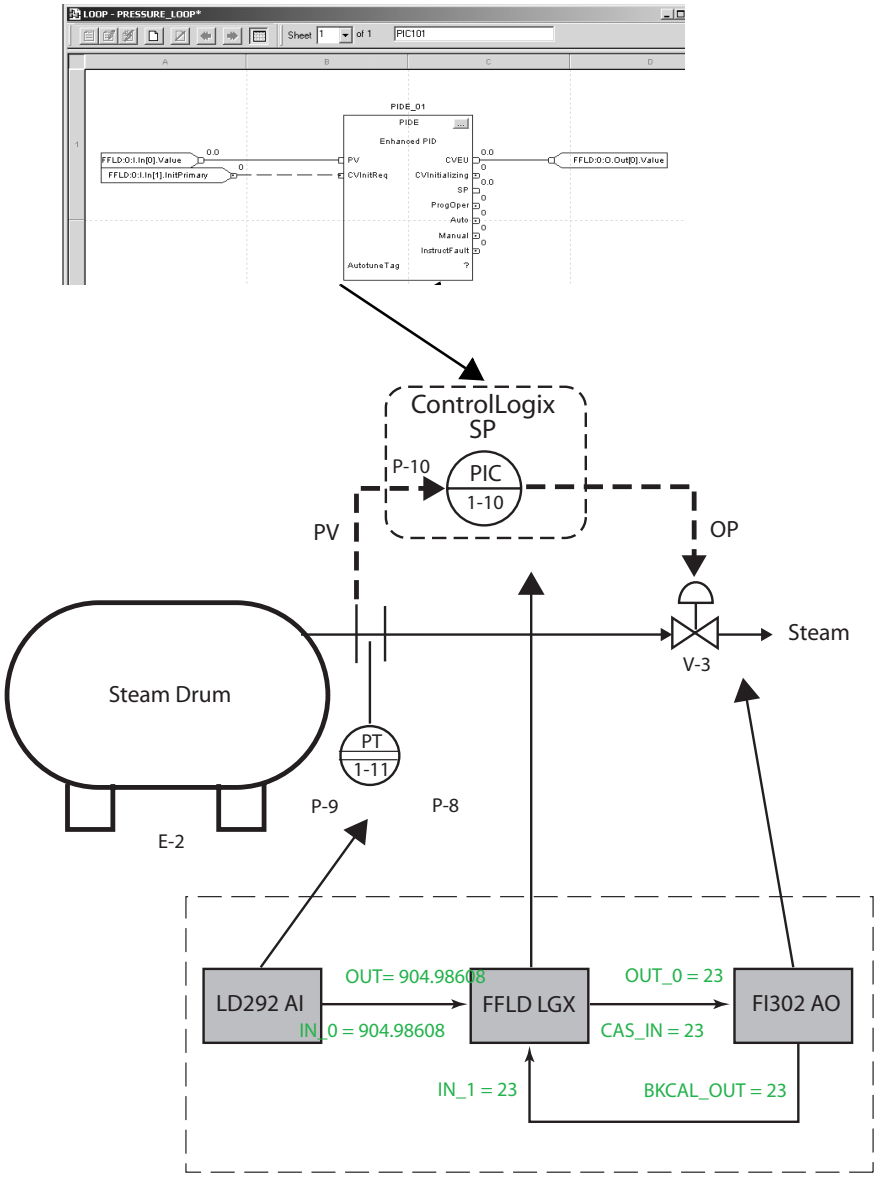
In This Chapter

RSFieldbus PID With ControlLogix Application Example

This example shows you how to incorporate the following devices into a project with a ControlLogix controller:

- Rockwell Automation 1757-FFLD linking device
- Smar FI 302
- Smar LD 292

This strategy will use the Fieldbus devices as I/O and the ControlLogix controller as the PID controller.



Create A New RSFieldbus Project

Open a Project

1. Select Start ⇒ Programs ⇒ Rockwell Software ⇒ RSFieldbus ⇒ RSFieldbus.

   The Licensing System Information window shows how many Blocks are licensed on your system.

2. Click OK.

   The RSFieldbus window opens.

3. Click  , and select Project.

4. Enter >PID < for the name and click Save.

Save your project often to prevent loss of time and work.

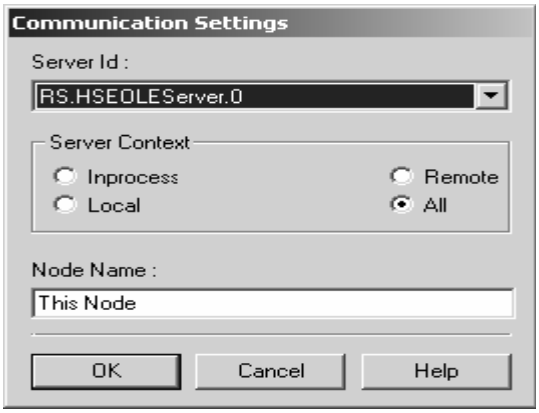
The Project window opens.

Define the Server

This step defines the OPC Server and where it is located.

1. In the Project window, right-click the Fieldbus Networks icon and select Communication Settings.

   The Communication Settings window opens.



2. Verify that the settings are the same as the window above, and click OK.

Create a New HSE Network

1. In the Project window, right-click the Fieldbus Networks icon and select New Fieldbus.

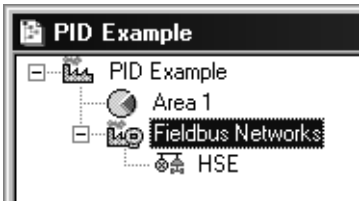
   The New Fieldbus window opens.

2. Select HSE for the Type of Fieldbus.

3. Enter a tag for the Fieldbus and click **OK**.

Tags cannot include a "." (period). If a separator is needed, we suggest using an "_" (underscore).

The HSE is added to the Project.



Define the HSE Host

This step defines your PC as the HSE Host.

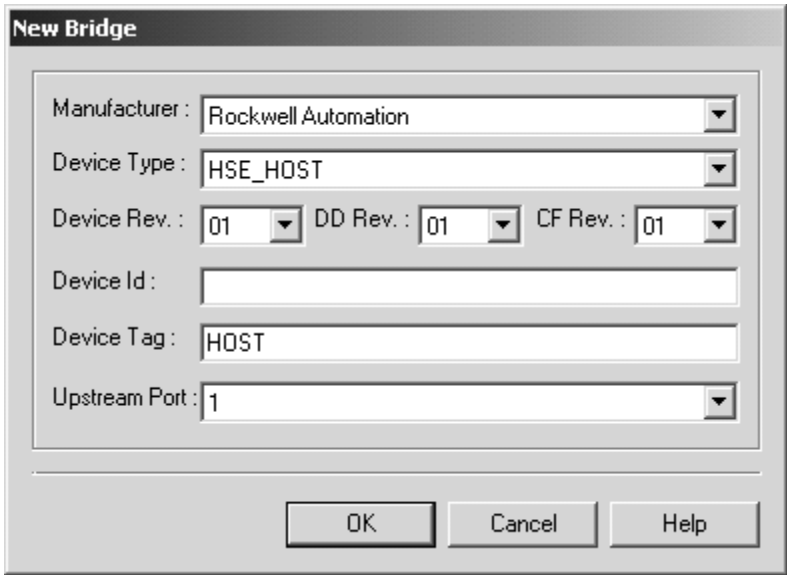
1. In the Project window, right-click the HSE and select Expand.

   The HSE window opens.

2. In the HSE window, right-click the HSE and select New Bridge.

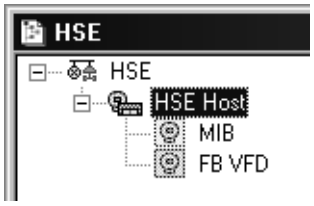
   The New Bridge window opens.

3. Select the following settings: give the New Bridge the Device Tag of HOST.



4. Click OK.

   The HSE Host is added to the HSE.



Change Device Class to Link Master

1. Right-click the HSE Host and select Attributes.

   The Bridge attributes window opens.

2. Select Link Master for the BOF Class, verify that Root Bridge is selected, and click OK.

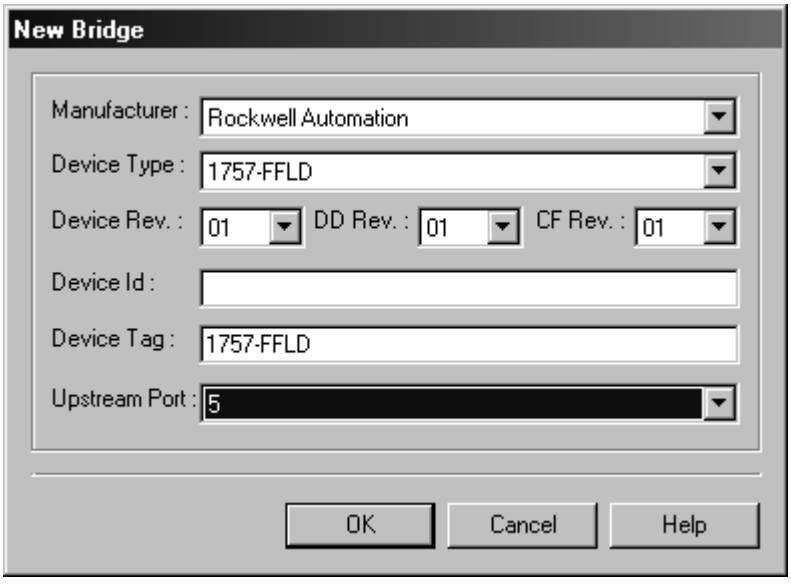
   By selecting the HSE Host as the Link Master, it becomes the Primary Link Master. Therefore, all other field devices can not be configured as the Primary Link Master.

Create a New 1757-FFLD - Bridge

1. Right-click the HSE and select New Bridge.

   The New Bridge window opens.

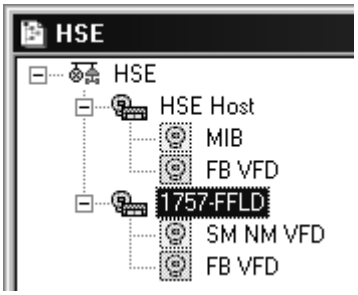
2. Select the following settings for the 1757-FFLD (linking device). Give the New Bridge the Device Tag of FFLD



The Upstream Port must be 5 for the linking device to connect to the HSE Host. Ports 1–4 are reserved for H1 ports.

3. Click OK.

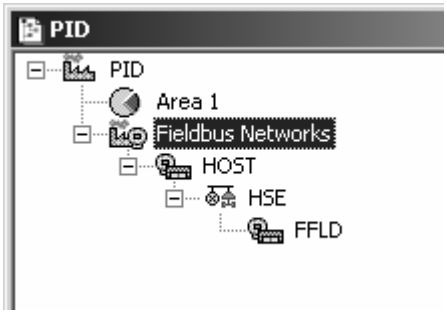
   The linking device is added to HSE.



Change the Root Bridge

1. Right-click the linking device and select Attributes.
2. Select Bridge for the BOF class and click OK.
3. Close the HSE window.

   The Project window reflects your additions.



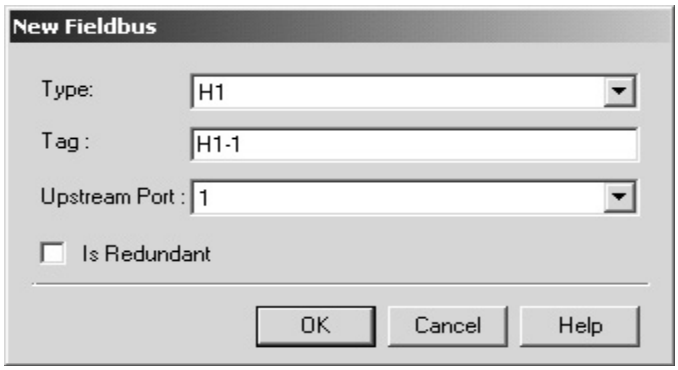
Create a New Fieldbus - H 1

1. In the Project window, right-click the linking device icon and select New Fieldbus.

   The New Fieldbus window opens.

2. Select H1 for the Type of Fieldbus.

3. Enter >H1-1< for the Tag.



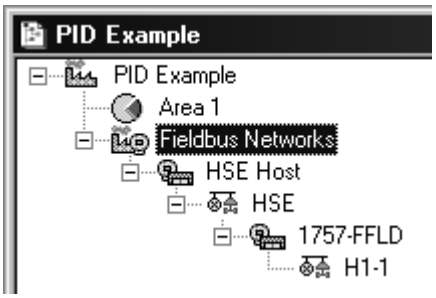
The linking device has 2 or 4 H1 ports. We recommend that you name them accordingly. For example, H1-1 indicates that this is the first H1 port..

4. Select the Upstream Port to which you are connected.

   The linking device does not support redundancy yet, do not select "Is Redundant".

5. Click OK.

   The Fieldbus (H1-1) is added to the Project.



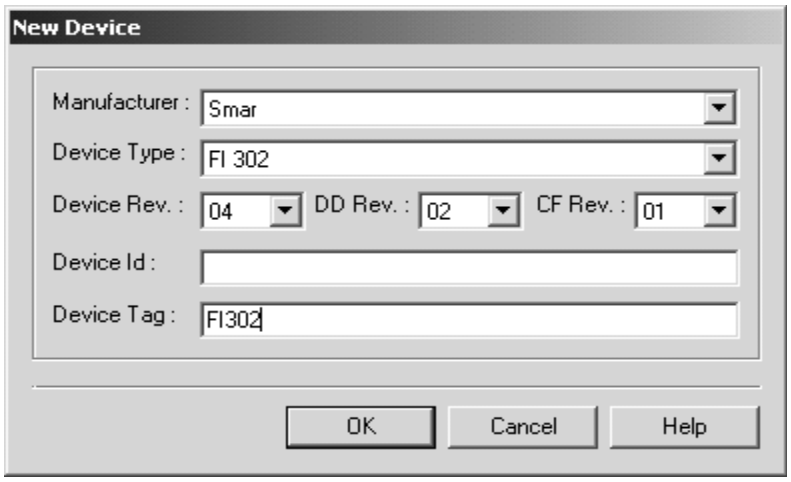
Add Devices

1. In the Project window, right-click the H1 and select Expand.

   The H1-1 (Fieldbus) window opens.

2. In the H1-1 window, right-click the H1 and select New Device.

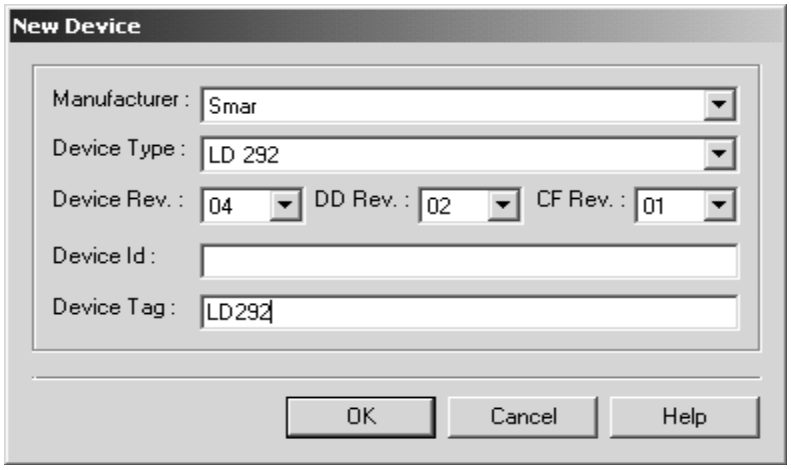
3. Select the following settings for the Smar FI 302 and click OK.



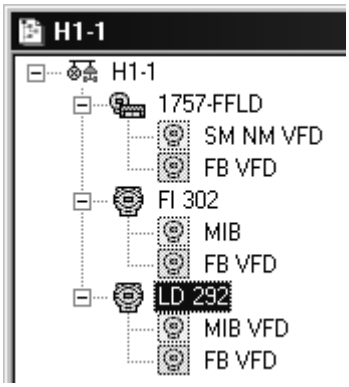
IMPORTANT The Device Rev, DD Rev and CF Rev values in this window default to the latest version in the Device Support files. If your devices do not match these values, change them accordingly.

If you do not correctly match your devices to their version values, you will have to delete the devices and recreate them.

4. Repeat steps 1 and 2, substituting LD 292 for the Device Type and >LD292< for the Device Tag.



The Devices are added to the H1.



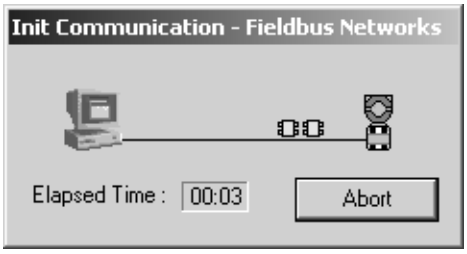
Configure Communication Settings

Initialize Communications and Associate the Linking Device

Before continuing, click Window ⇒ Tile to make all windows visible at the same time.

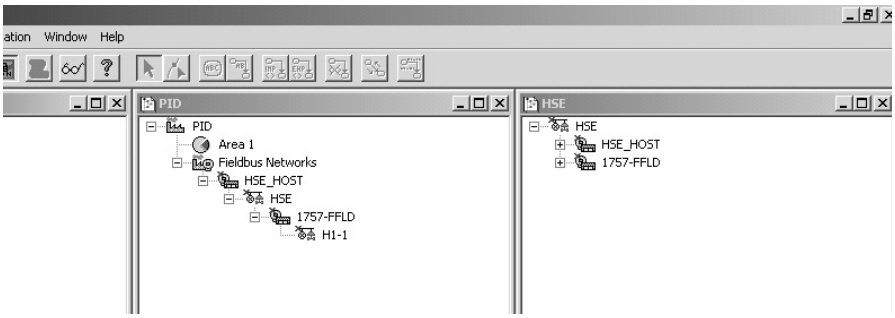
1. Click the On Line button  .

   The Initialize Communication animation begins.



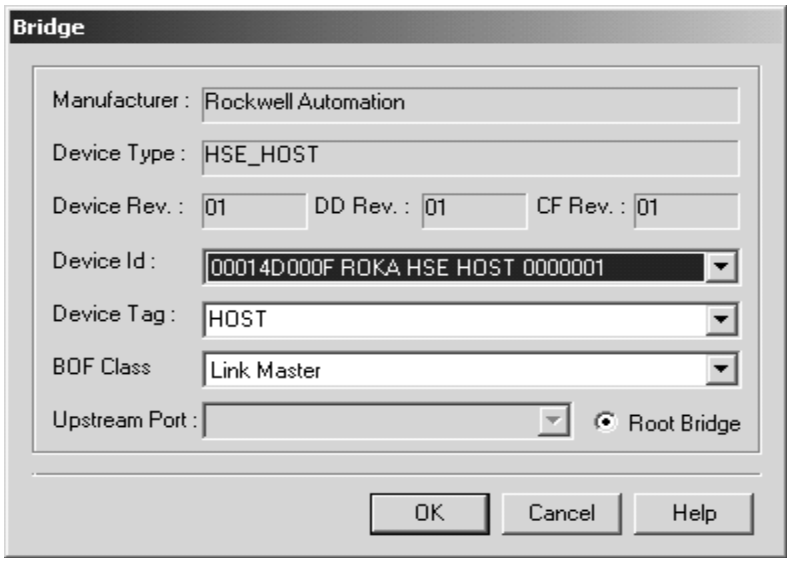
   During this time, all Bridges and Fieldbus are identified.

   A red x appears next to the H1, FFLD and Device icons. This indicates that they need to be associated with the actual hardware.



   There is an order of precedence in associating devices. The bridges on the HSE network need to be associated prior to the devices on the H1 network, since the linking device is the link between the H1 and the PC.

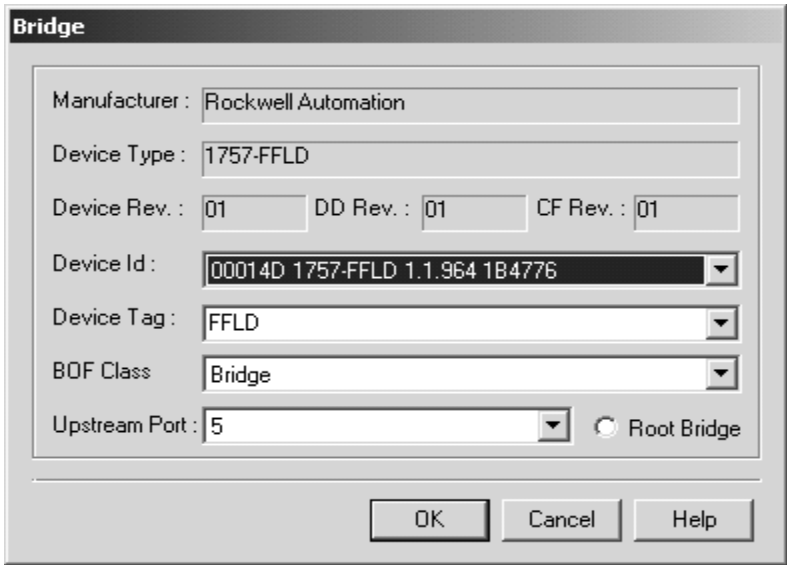
2. In the HSE window, right-click the HOST icon and select Attributes. Using the drop-down menu for the Device Id, select the following setting.



This selection is not available until the communications are on line.

3. Click OK.

4. In the HSE window, right-click the linking device and select Attributes. Using the drop-down menu for the Device Id, select the following setting:



5. Click OK.

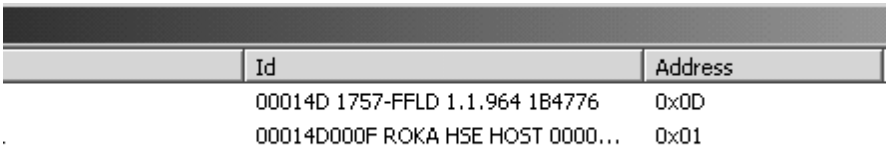
   Note that the red x next to each device in the HSE window has disappeared once the association has been made. This indicates that communication with the linking device is established

Check the Live List

This step involves verifying that you are connected to the proper devices.

1. To view the Live List for the HSE, right-click the desired HSE and select Live List.

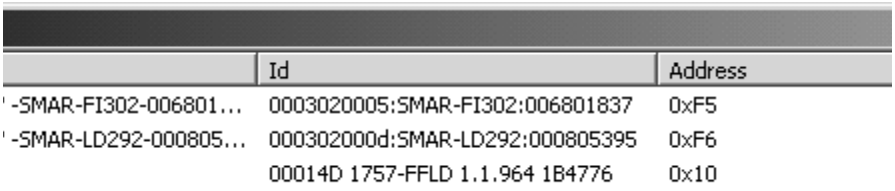
   The HSE Live List opens, showing all the bridges connected to your PC.



	Id	Address
	00014D 1757-FFLD 1.1.964 1B4776	0x0D
	00014D000F ROKA HSE HOST 0000...	0x01

   Devices that are ghosted in the HSE Live List have not yet established a connection to RSFieldbus through the HSE Server.

2. Right-click H1-1 network and select Live List.



	Id	Address
-SMAR-FI302-006801...	0003020005:SMAR-FI302:006801837	0xF5
-SMAR-LD292-000805...	000302000d:SMAR-LD292:000805395	0xF6
	00014D 1757-FFLD 1.1.964 1B4776	0x10

   The H1-1 Live List opens, showing all of the devices connected through your linking device. Devices that are ghosted in the H1-1 Live List have not yet established a connection to RSFieldbus through the HSE Server and linking device. Prior to continuation, the device must not be in a ghosted state in the live list.

Associate Devices

1. Once all the devices have become solid on the H1-1 live list, select the H1-1 Fieldbus window.

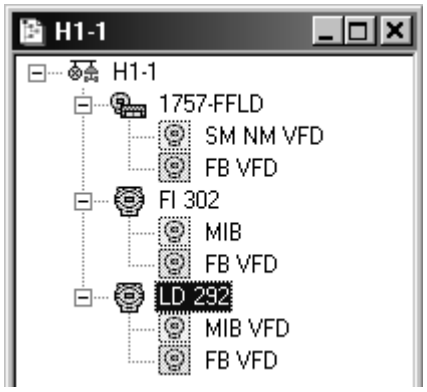
2. In the HSE window, right-click the FI302 and select Attributes.

3. In the Device Attributes window, select your FI302 from the Device Id drop-down list and click OK.

Note that the Device ID is specific to the device based on type and serial number.

The red x on the FI302 disappears. This indicates that communication with the Device is established.

4. Repeat steps 1 and 2 with the LD292.



The Id drop-down list has one less selection due to the choices made previously.

Assign Tags

In this section you will change attributes in order to differentiate between similar devices.

IMPORTANT The tag of the device in the project and the online device in the live list match one another. This will help to download successfully.

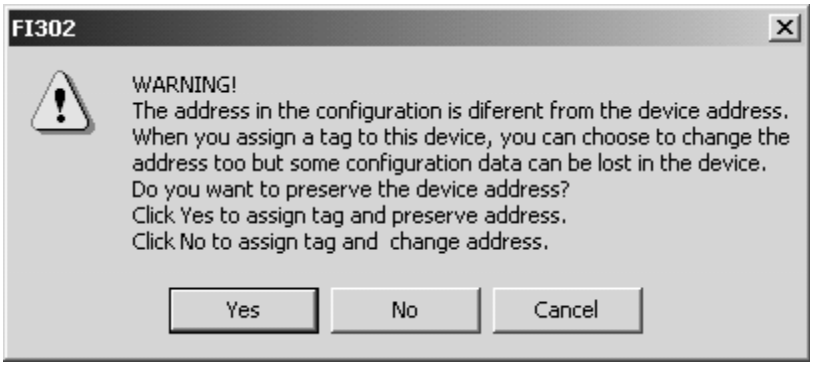
1. In the H1-1 Fieldbus window, right-click the linking device and select Assign Tags.

   The Assign Tag window opens and the Tag is sent to the Device. The linking device will momentarily disappear from the live list and reappear with the new tag. Wait until the linking device is solid in both the H1-1 and the HSE live lists before proceeding. Note that since the linking device is busy with tag assignment, the other devices will disappear until the linking device reappears.

2. Use the H1-1 and HSE Live Lists to verify that the Device Tag has changed.

3. In the H1-1 Fieldbus window, right-click the linking device and select Assign Tags.

   A warning window appears.



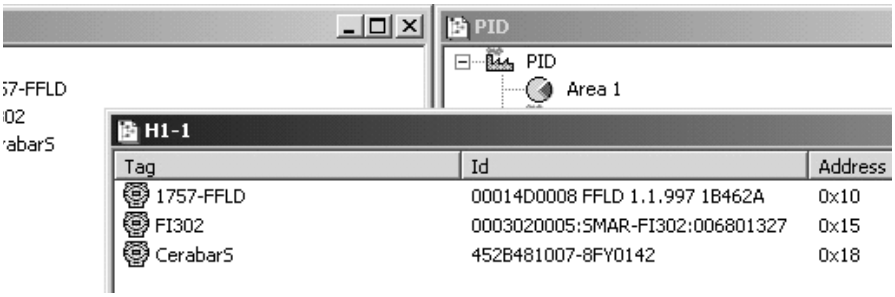
4. Read the warning carefully and then select Yes.

   The Assign Tag window opens and the Tag is sent to the Device. The FI302 will momentarily disappear from the live list and reappear with the new tag. Wait until the FI302 is solid in both the H1-1 live list before proceeding.

5. Repeat steps 3-4 with the LD292.

   New devices added to the H1 lines must be re-addressed. Doing this optimizes network performance.

6. Use the H1-1 Live List to verify that the Device Tags have changed.



Add Function Blocks

1. In the H1-1 window, expand the linking device.

2. Right-click the FB VFD icon and click New Block.

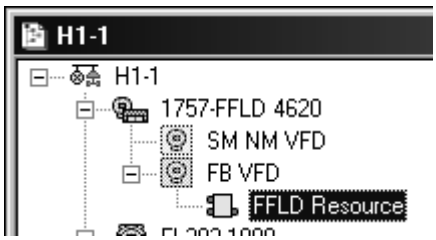
   The New Block window opens.

3. Select Resource Block for the Block Type.

4. Enter >FFLD Resource< for the Block Tag.

5. Click OK.

   The Block is added to the project.



6. Right-click the Resource Block and select Off Line Characterization.

   The Off Line window opens.

To view all of the parameters, click  and maximize the Characterization window.

7. Expand the MODE_BLK parameter.

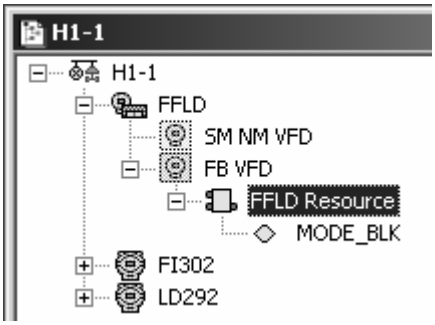
8. Select TARGET, then click in the Value column and select Auto.

9. Click End Edit (or press <Enter>) to complete the edit.

   Auto is shown next to TARGET.

10. Click Close.

    The MODE_BLK parameter icon is shown under the Resource Block icon.



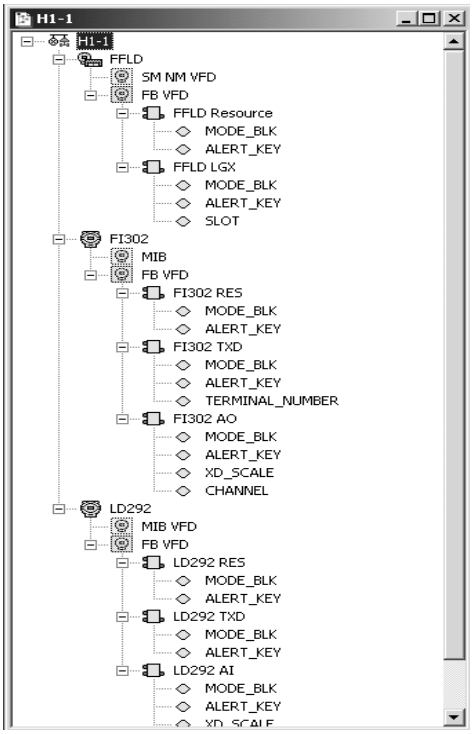
Add Function Blocks to the Devices

Use the table below and the procedure from Add Function Blocksto add additional Function Blocks to the devices.

Tag names should not have spaces in them for proper OPC communications..

Device	Block Type	Block Tag	Parameter	Element	Value
FFLD	Resource	FFLD_Resource	MODE_BLK	TARGET	Auto
			ALERT_KEY		1
	Logix	FFLD_LGX	MODE_BLK	TARGET	Auto
			ALERT_KEY		1
			SLOT (this value is used by ControlLogix)		0
FI302	Resource	FI302_RES	MODE_BLK	TARGET	Auto
			ALERT_KEY		1
	Transducer	FI302_TXD	MODE_BLK	TARGET	Auto
			ALERT_KEY		1
			TERMINAL_NUMBER		1
	Analog Output	FI302_AO	MODE_BLK	TARGET	CAS
			ALERT_KEY		1
			XD_SCALE (these values must match the FINAL_VALUE_RANGE of the transducer block	EU_100	20
				EU_0	0
				UNITS_DECIMAL	mA
				DECIMAL	2
			CHANNEL (this must match the TERMINAL_NUMBER of the transducer block		1
LD292	Resource	LD292_RES	MODE_BLK	TARGET	Auto
			ALERT_KEY		1
	Transducer	LD292_TXD	MODE_BLK	TARGET	Auto
			ALERT_KEY		1
	Analog Input		MODE_BLK	TARGET	Auto
			ALERT_KEY		1
			XD_SCALE (these values must match the FINAL_VALUE_RANGE of the transducer block	EU_100	5080
				EU_0	0
				UNITS_DECIMAL	mm H20 (68°F)
				DECIMAL	2
			CHANNEL		1
			L_TYPE		Direct

When you have added all the of Blocks and their Parameters, your H1-1 Fieldbus network should look similar to the one below.

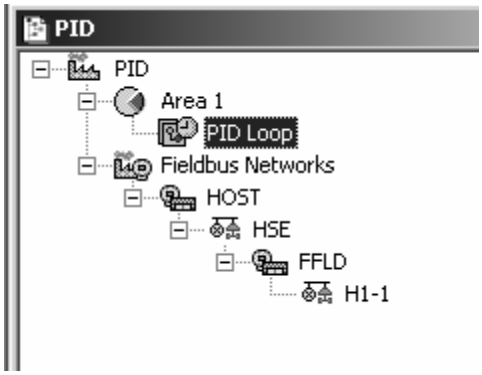


Create a Fieldbus Control Strategy

1. In the Project window, right-click the Area 1 icon and select New Process Cell.

2. Enter >PID Loop< for the Tag and click OK.

   The Process Cell is added to the Project.



3. Right-click the Process Cell icon and click Expand.

   The Process Cell window opens.

4. In the Process Cell window, right-click the Process Cell icon and select New Control Module.

5. Enter >Pressure< for the Tag and click OK.

   The Pressure Control Module is added to the Project.

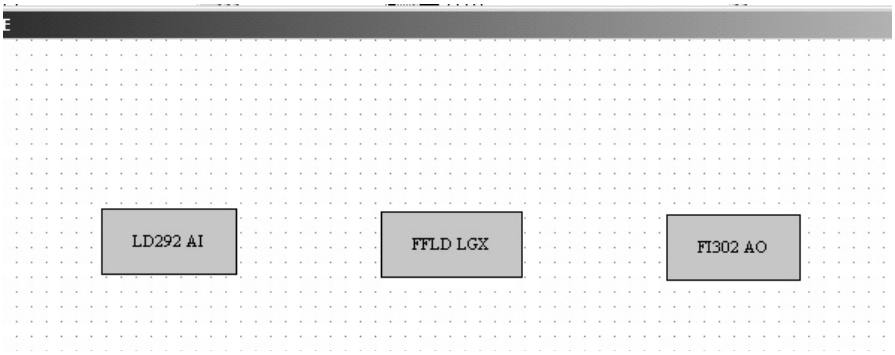
6. Right-click the Pressure icon and select Strategy.

   The Strategy window opens.

Add Function Blocks to the Strategy

1. In the Strategy window, click Options ⇒ Function Block Icons ⇒ Rectangle.

2. Drag and drop the FFLD LGX, FI302 AO and LD292 AI blocks from the H1-1 Fieldbus window to the Strategy window to resemble the picture below.



Create Links

To create Fast Links, refer to the linking device user manual, publication 1757-UM010.

1. In the Strategy window, click the Link button  .

2. Click the AI Block.

   The Output Parameter Selection window opens.

3. Select the OUT pin.

   The pin fills to show that it is selected.

4. Click OK.

   A blue line is added to the AI block to represent the incomplete link.

5. Click the LGX Block to complete the link.

   Hold <Ctrl> to draw straight lines.

   The Input Parameter Selection window opens.

6. Select the IN_0 pin and click OK.

   A link is drawn from the AI block to the LGX block.

7. Click the LGX block again.

8. Select the OUT_0 pin and click OK.

9. Click the AO block to complete the Link.

10. Select the CAS_IN pin and click OK.

    A link is drawn from the PID block to the AO block.

11. Click the Link button and select the AO block again.

12. Select the BKCAL_OUT pin and click OK.

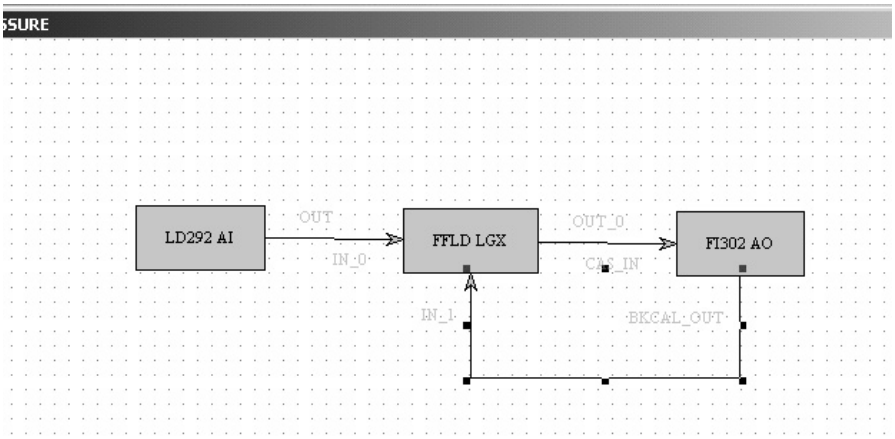
13. Click below the block, move the cursor under the Logix block, and click again.

    A segmented line is drawn.

14. Click the LGX block to complete the Link.

15. Select the IN_1 pin and click OK.

    Your Strategy window should look like this.



Download the Configuration

Before Downloading you must complete the Export Tags function. This allows you to view Function Block parameters in the On Line mode.

Export Tags

1. In the Project window, right-click the Project name (in this case, PID), and select Export Tags.

   The Export Tags window opens.

2. Click Save to accept the default file name.

3. Click Yes to the Export Tags window question and replace the file.

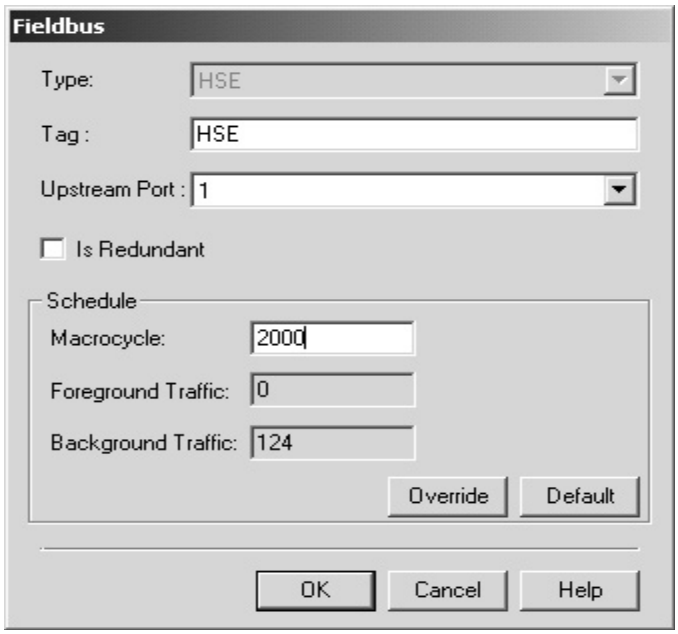
4. Click OK to acknowledge that the Tags were exported successfully.

Download

It is important that the Macrocycle times for the HSE and the H1-1 networks match for download purposes. This will aid the download process and communications synchronization between the HSE and the H1-1 networks.

1. In the HSE Fieldbus window, right-click the HSE icon and select Attributes.

2. Enter a value of 2000 for the Macrocyle and click OK.



3. Repeat this process for the H1-1 fieldbus.

4. In the HSE Fieldbus window, right-click the HSE icon and select Download.

5. Click Yes to start loading the configuration.

   The Download window shows the download progress.

6. In the H1-1 Fieldbus window, right-click the H1-1 icon and select Download.

7. Click **Yes** to start loading the configuration.

   The Download window shows the download progress.

8. To download the nodes with schedule errors, repeat steps 1–4 substituting Download Schedule for Download.

9. After the downloads are complete, click the Online Monitoring button  in the Strategy window.

   The real-time values are shown in the Strategy window.

   The parameters that are active and good quality are displayed in green. The parameters that are inactive or bad quality are displayed in red. The red parameters on the FFLD LGX block are due to the lack of communication with the ControlLogix controller.

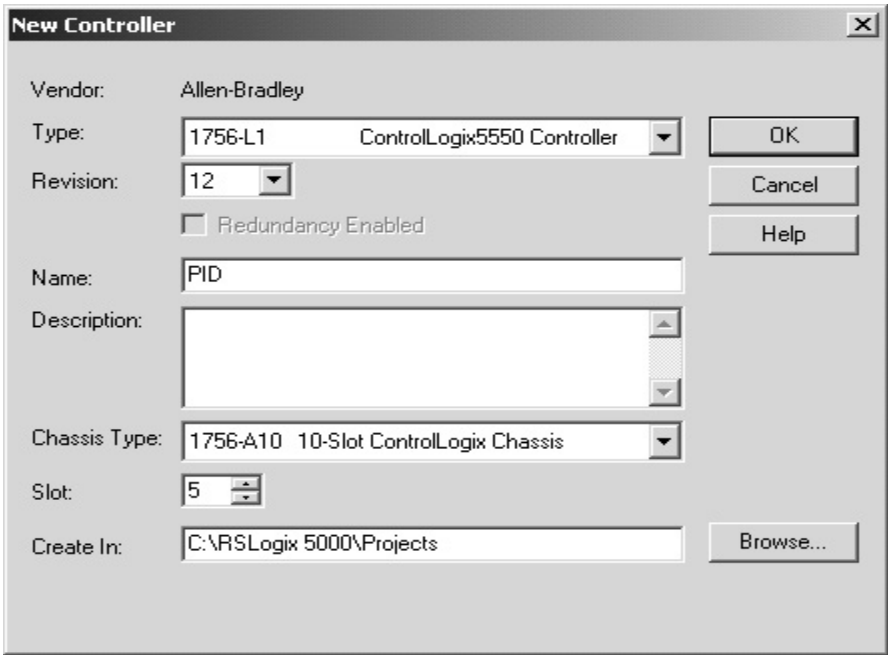
Create a ControlLogix Control Strategy

1. Start RSLogix 5000.

   From the Start menu, select Programs ⇒ Rockwell Software ⇒ RSLogix 5000 Enterprise Series ⇒ RSLogix 5000.

2. Select File ⇒ New.

Enter >PID<for the name.



Use the 'Type:' drop-down selector to choose the appropriate processor for your lab hardware configuration. Also use the Revision drop-down selector to choose the appropriate processor firmware level.

3. Your controller is added to the new project.

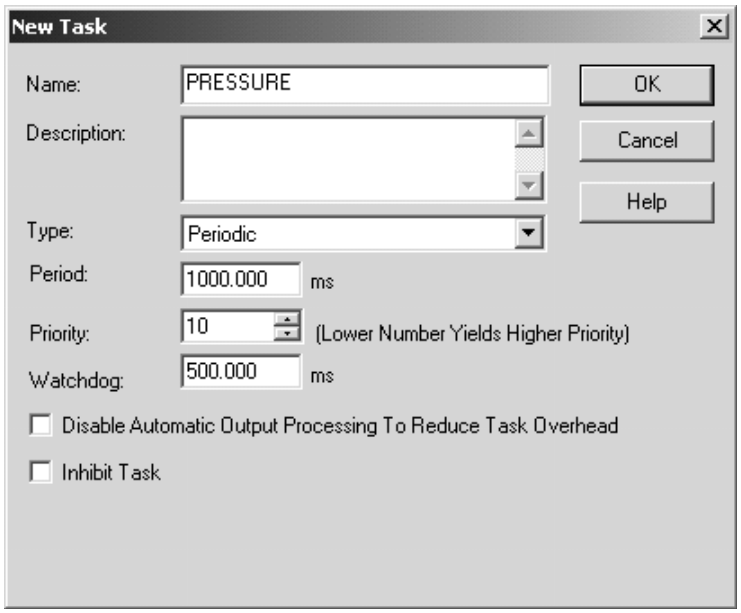
Create and configure a new periodic task

The ControlLogix PID function block uses an algorithm that needs a defined time period of operation, so a Periodic Task needs to be created.

1. Right-click Task, and select New Task.

   The New Task window opens.

2. Enter >Pressure< for the Name and 1000 (ms) for the Period.



The reason for 1000 (ms) scheduling is that PID loops generally do not require fast executions.

3. Click OK.

   Pressure is added to the Tasks.

Create a Program

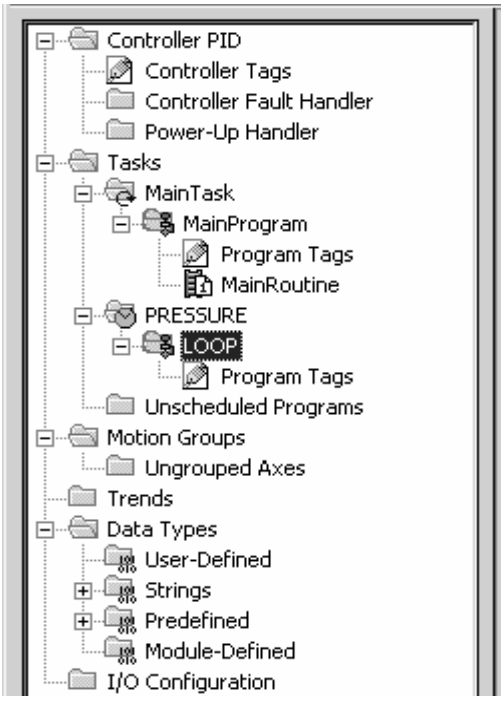
In this section, you will create a program to run in your task.

1. Right-click Pressure and select New Program.

   The New Program window opens.

2. Enter >Loop< for the Name and click OK.

   Loop is added to the task.

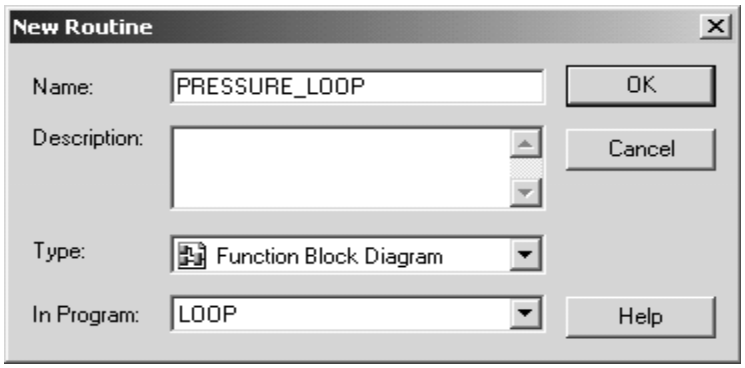


Create and Schedule a Routine

1. Right-click Loop and select New Routine.

   The New Routine window opens.

2. Enter >Pressure Loop< for the Name.



3. Select Function Block Diagram for the Type.

4. Click OK.

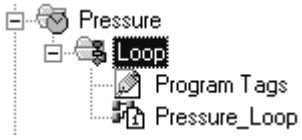
   Pressure Loop is added to the Program.

5. Right-click Loop and select Properties.

6. On the Configuration tab, select Pressure Loop for the Main Routine.

7. Click Apply, then click OK.

   Pressure Loop is designated the Main Routine.

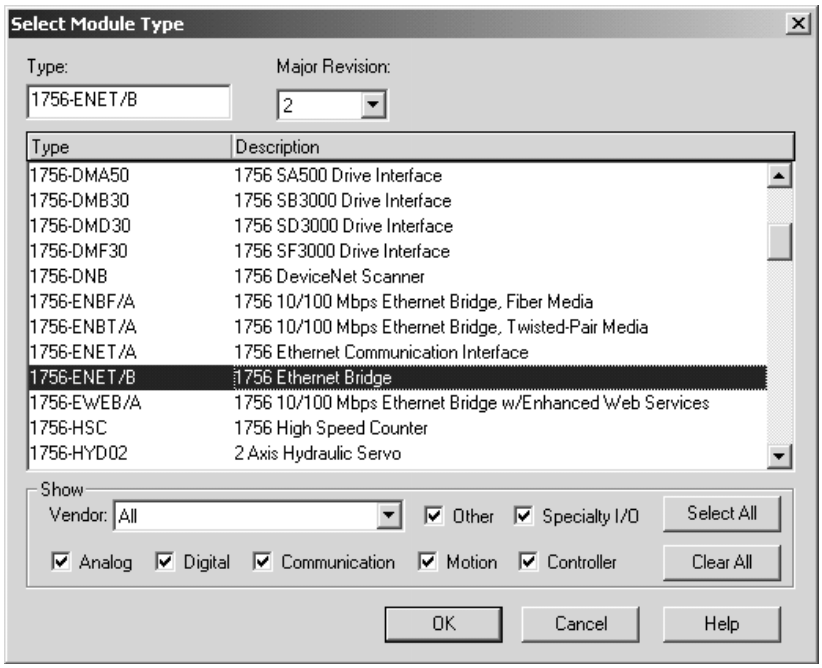


Add Your Ethernet Module

1. Right-click I/O Configuration, and select New Module.

   The Select Module Type window opens.

2. Select the ethernet module that is in the rack with the ControlLogix controller and click OK.



   The Module Properties window opens.

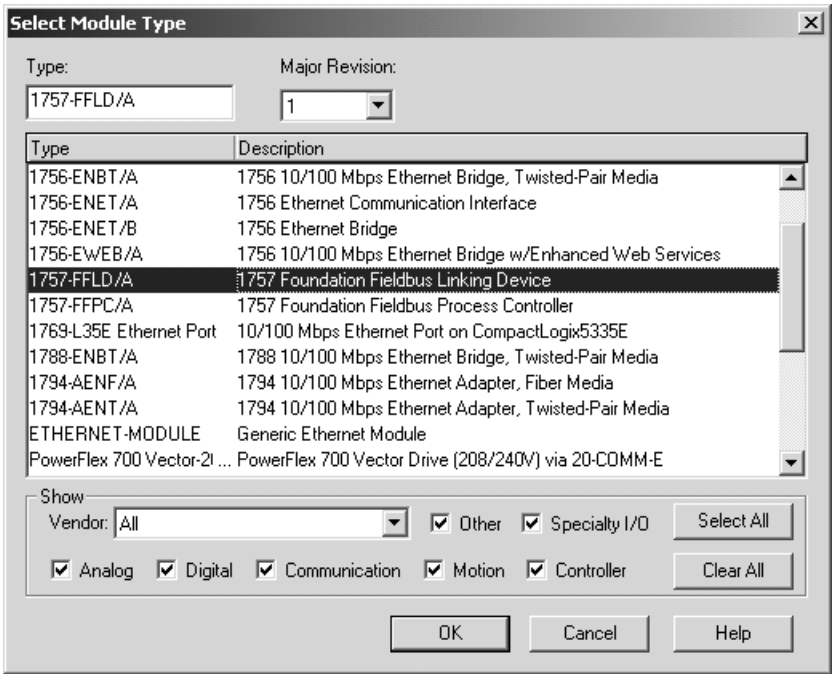
3. Enter a name, slot number and IP address.

4. Select Disable Keying and click Finish.

   Your Ethernet module is added to the project.

Add the Linking Device

1. Right-click the ethernet module and select New Module.
2. Select the 1757-FFLD/A and click OK.



3. Enter a name and I/P address.
4. Select Disable Keying and click Finish.

   Your linking device is added to the project.

Add Your Logix Block

1. Right-click the linking device and select New Module.
2. The Logix Block is your only choice, so click OK.
3. Enter >FFLD Logix< for the name, and select Disable Keying.

The Slot Value must match the value that you set for the Logix Block Slot parameter on page 4-16. Because the default is 0, you do not need to change it here.

4. Click **Finish.**

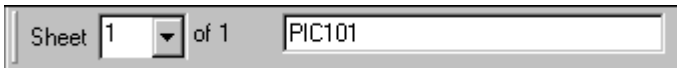
   The Logix Block is added to the project.

Edit the PID Regulatory Routine

1. Double-click Pressure Loop.

   A blank sheet opens.

2. Enter >PIC101< in the name box.

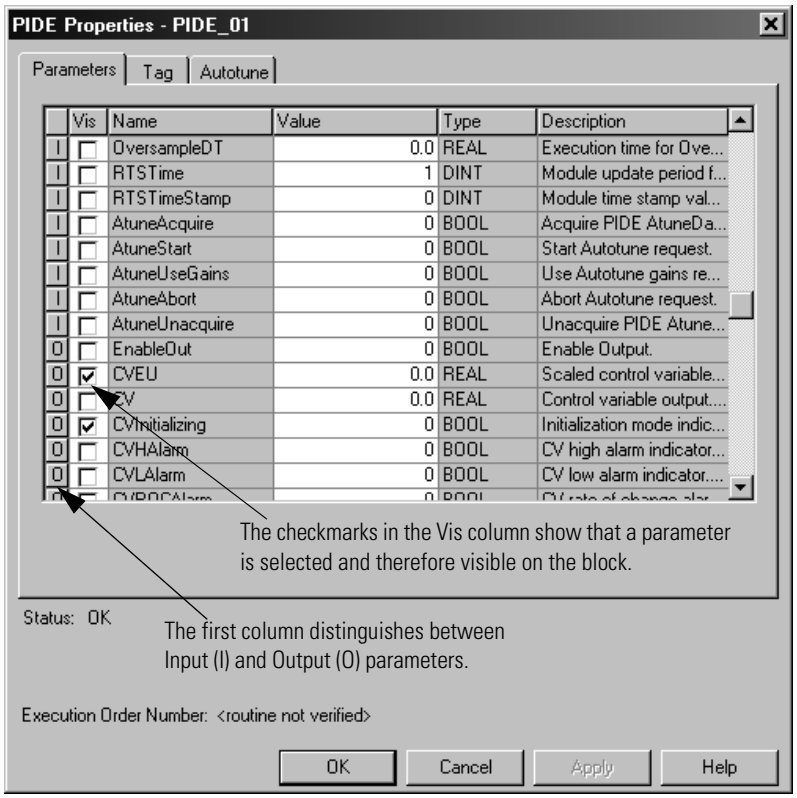


3. On the Process Tab, click PIDE (Enhanced PID Block).

   The block is added to the sheet.

4. Click the Block Properties button  .

   The PIDE Properties window opens.

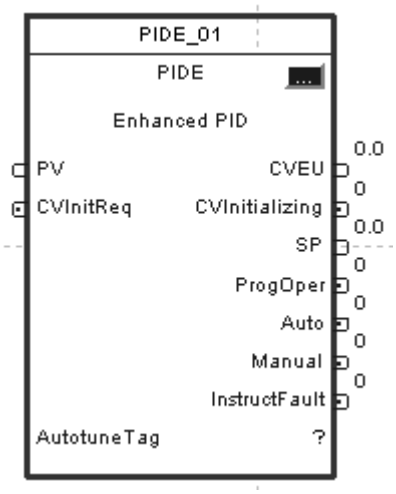


5. On the Parameters tab, select and deselect the Vis parameters so that only the following parameters are selected: This exposes the desired pins on the PIDE block.

Input Parameters	Output Parameters
PV	CVEU
CVInitReq	CVInitializing
	SP
	ProgOper
	Auto
	Manual
	InstructFault

6. Click OK.

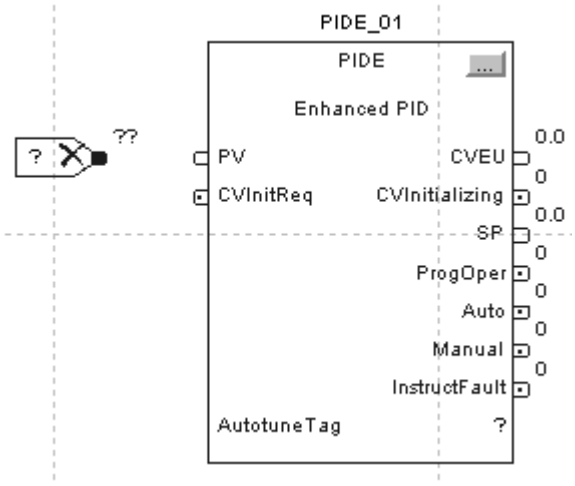
   The block is updated with your selections.



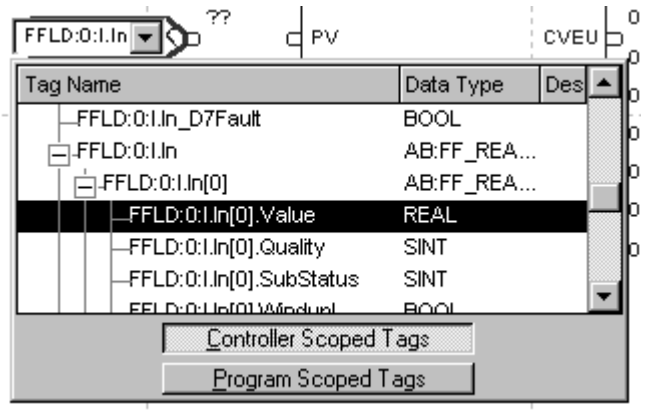
7. Click the Input Reference button  .

   The Input Reference is added to your sheet.

8. Drag and drop the Input Reference to the left of the PIDE block.



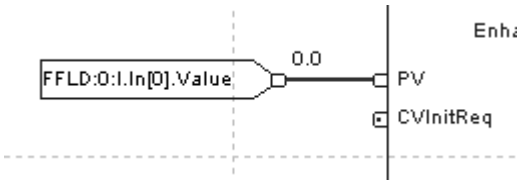
9. Double-click the single ? on the Input Reference and select the Controller Scoped tag, FFLD:0:I.In[0].Value.



This tag is the IN_0 pin from the RSFieldbus Logix Block and the LD292 AI input.

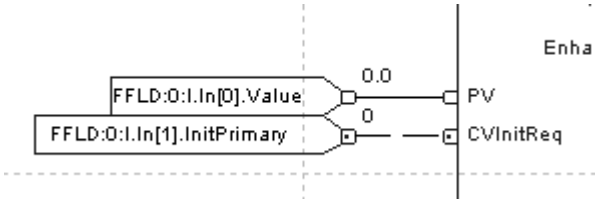
10. Press <Enter>.

11. Click the FFLD:0:I.In[0].Value pin, then the Source A pin to connect them.



12. Repeat steps 7-11 to connect the FFLD:0:I.In[1].InitPrimary tag to the CVInitReq parameter.

This tag is the IN_1 pin from the RSFieldbus Logix Block and the FI 302 BKCAL_OUT.

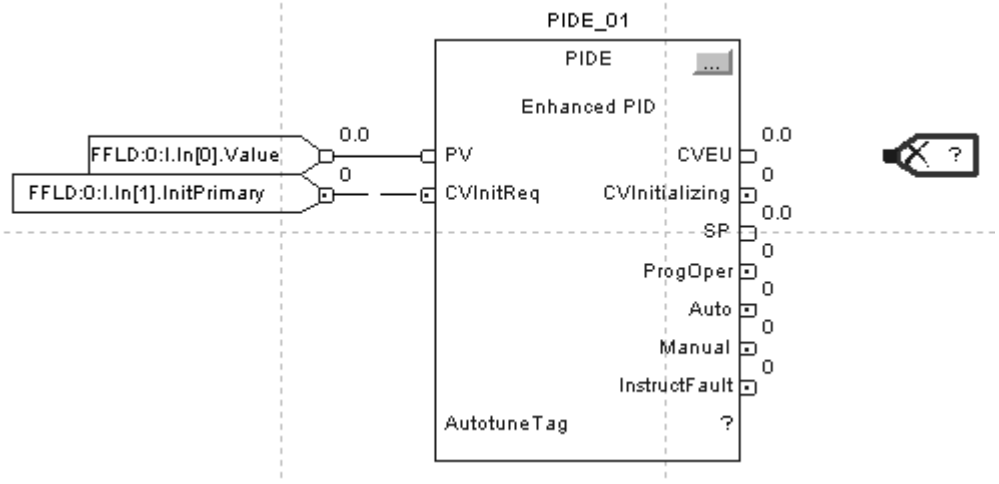


This input stops the PIDE function block from generating an output in the AO.

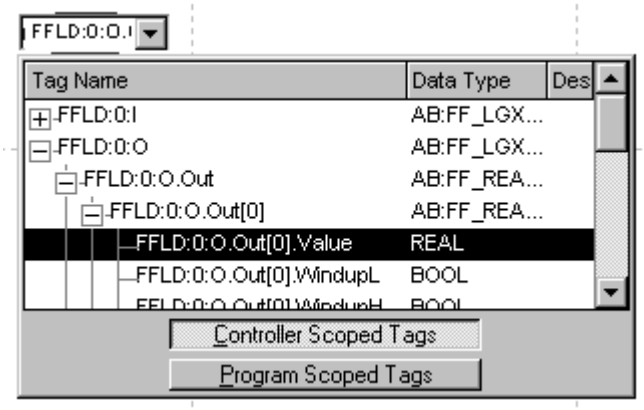
13. Click the Output Reference button  .

The Output Reference is added to your sheet.

14. Drag and drop the Output Reference to the right of the PIDE block.



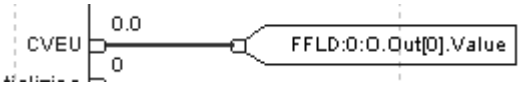
15. Double-click the single ? on the Output Reference and select the Controller Scoped tag, FFLD:0:O.Out[0].Value.



This tag is the OUT_0 pin from the RSFieldbus Logix Block and the FI 302 AO input.

16. Press <Enter>.

17. Click the FFLD:0:O.Out[0].Value pin, then the CVEU pin to connect them.

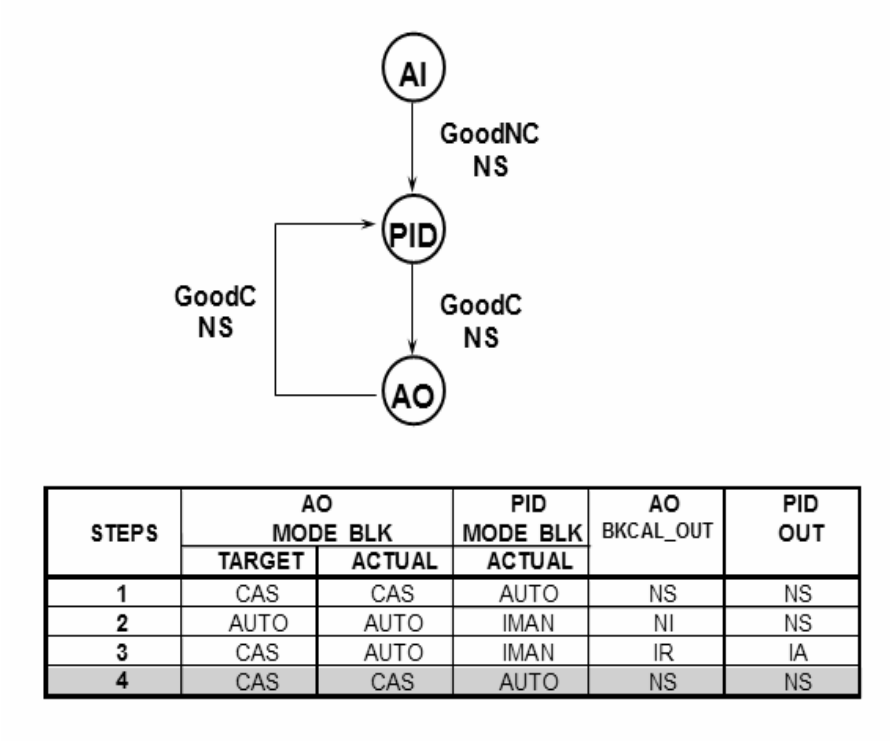


18. Right-click Pressure_Loop and select Verify to verify the routine.

Add Handshaking Logic

In this section, you'll add logic for the Fieldbus handshaking so the operation will begin in automatic mode. The RSLogix 5000 PID does not have normal Fieldbus handshaking (shown in Figure) so logic must be built to accommodate it.

Normal Fieldbus Handshaking



STEPS	AO MODE_BLK		PID MODE_BLK	AO BKCAL_OUT	PID OUT
	TARGET	ACTUAL	ACTUAL		
1	CAS	CAS	AUTO	NS	NS
2	AUTO	AUTO	IMAN	NI	NS
3	CAS	AUTO	IMAN	IR	IA
4	CAS	CAS	AUTO	NS	NS

Every Fieldbus value has quality and status associated with it. These indications are separated by the ControlLogix Logix block, as shown below.

FFLD:0:I.In[1]	{...}	{...}		AB:FF_REAL_STRUCT:I:0
FFLD:0:I.In[1].Value	0.0		Float	REAL
FFLD:0:I.In[1].Quality	0		Decimal	SINT
FFLD:0:I.In[1].SubStatus	0		Decimal	SINT
FFLD:0:I.In[1].WindupL	0		Decimal	BOOL
FFLD:0:I.In[1].WindupH	0		Decimal	BOOL
FFLD:0:I.In[1].InitPrimary	0		Decimal	BOOL
FFLD:0:I.In[1].Initializing	0		Decimal	BOOL
FFLD:0:I.In[1].InitiateFault...	0		Decimal	BOOL

The table below shows the SubStatus value on Initialization Request. Logic needs to be built so that the value of 2 for the BKCAL_OUT from the AO block is being monitored.

Quality		**Substatus**	
0	BAD - the value is not useful.	X	Any
1	Uncertain - the quality of the value is less than normal, but may still be useful.	X	Any
2	Good NC	X	Any
3	Good Cascade - value may not be useful for control. SubStatus carries Back Initialization handshake.	0	NonSpecific
		1	Initialization Acknowledge
		2	Initialization Request
		3	Not Invited
		4	Not Selected
		5	Reserved
		6	Local Override
		7	Fault State Active
		8	Initiate Fault State

Once the Initialization Request is received by the ControlLogix routine, a signal must be generated and sent back to the RSFieldbus AO stating that initialization has been acknowledged. The Logix Block has an Initializing parameter associated with each output to accommodate this acknowledgement. This value must be toggled from off to on, then off again. As with the input values, this initializing value is part of the substatus of the output value.

FFLD:0:O.Out	{...}	{...}		AB:FF_REAL_STRUCT:O:0[8]
FFLD:0:O.Out[0]	{...}	{...}		AB:FF_REAL_STRUCT:O:0
FFLD:0:O.Out[0].Value	0.0		Float	REAL
FFLD:0:O.Out[0].WindupL	0		Decimal	BOOL
FFLD:0:O.Out[0].WindupH	0		Decimal	BOOL
FFLD:0:O.Out[0].InitPrimary	0		Decimal	BOOL
FFLD:0:O.Out[0].Initializing	0		Decimal	BOOL
FFLD:0:O.Out[0].InitiateFa...	0		Decimal	BOOL
FFLD:0:O.Out[0].Fault	0		Decimal	BOOL

Follow the steps below to add handshake logic.

1. From the Compare tab, click the Equal button 

and move the Equal block below the PIDE block.

2. Click the Block Properties button 

.

   The Equal Properties window opens.

3. Enter >2< for the SourceB value and click OK.

4. Click the Input Reference button  .

   The Input Reference is added to your sheet.

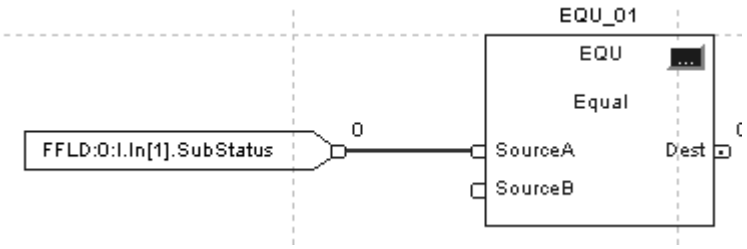
5. Drag and drop the Input Reference to the left of the Equal block.

6. Double-click the single **?** on the Input Reference and select the Controller Scoped tag, FFLD:0:I.In[1].SubStatus.

   This function block will monitor the SubStatus of the AO BKCAL_OUT for the Initialization Request.

7. Press <Enter>.

8. Click the FFLD:0:I.In[1].SubStatus pin, then the SourceA pin to connect them.



9. From the Move/Logical tab, click the Band button 

and move the Band block to the right of the Equal block.

10. Click the Output Reference button  .

    The Output Reference is added to your sheet.

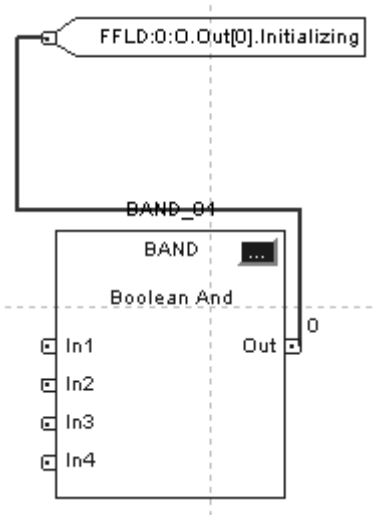
11. Drag and drop the Output Reference above the Band block.

12. Double-click the single ? on the Output Reference and select the Controller Scoped tag, FFLD:0:O.Out[0].Initializing.

    This function block will send the Initializing Acknowledge status to the AO CAS_IN based on the status of the PIDE and the Initialization Request.

13. Press <Enter>.

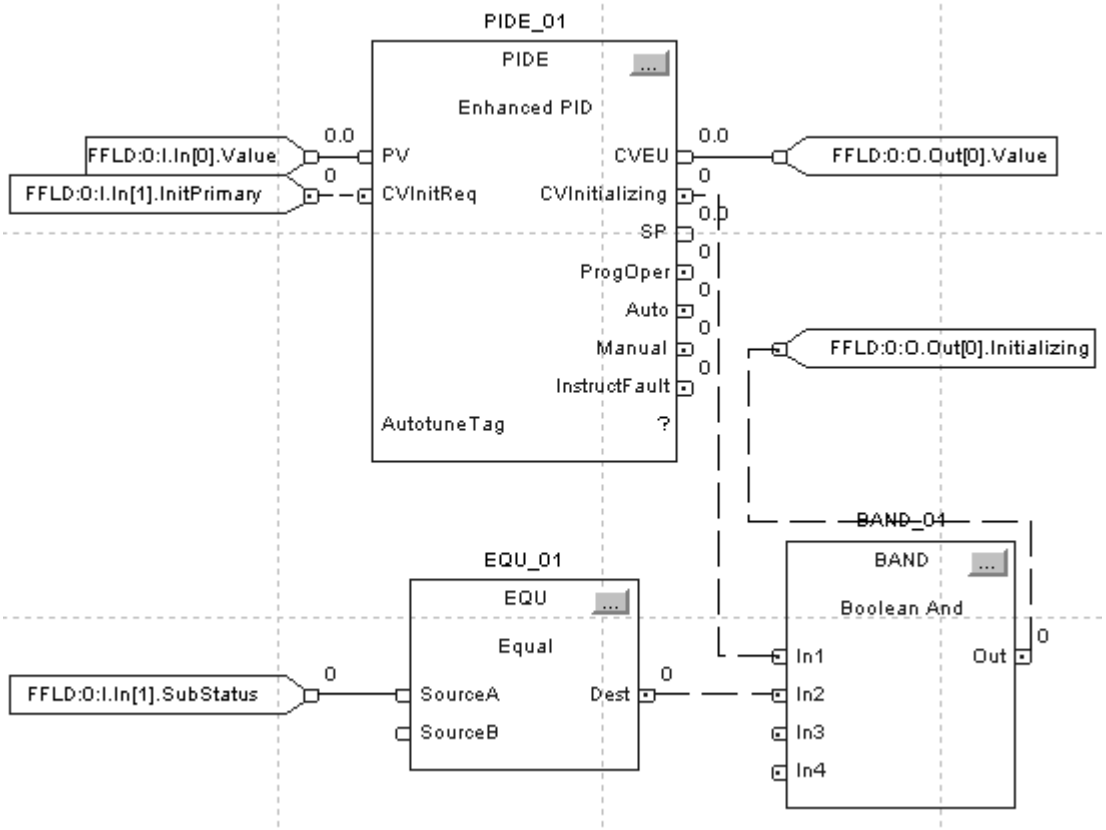
14. Click the FFLD:0:O.Out[0].Initializing pin, then the OUT pin to connect them.



15. Connect the Equal Dest pin to the Band In2 pin.

16. Connect the PIDE CVInitializing pin to the Band In1 pin.

    Your sheet should look similar to the one below.



17. Right-click Pressure_Loop and select Verify to verify the routine.

    To add robustness into the strategy, add logic to handle bad quality inputs or loss of input. You must force the PID into manual when the input is determined to be faulty so that you are not attempting to control with questionable field data as a reference.

18. Select the PID block properties button and edit it to expose the PVFault and ManualAfterInit input pins.

    The PVFault pin will force the PID function block into manual when the input is true and the ManualAfterInit pin will force the PID function block into manual when the CVInitReq is true.

19. Wire the existing FFLD:0:I.In[1].InitPrimary input reference to the ManualAfterInit input pin.

    This signal will force the PIDE fucntion block into manual when the initialization signal is received.

20. From the Move/Logical category of function blocks, select the BOR function block.

21. Wire the "Out" output of the BOR function to the PVFault of the PIDE function block.

22. Wire FFLD:0:I.In0Fault using an input reference connector to the In2 input pin of the BOR function block.

23. Finally, wire FFLD:0:I.In[0].InitiateFaultState using an input reference connector to the In3 input pin of the BOR function block.

    These inputs will cause a PVFault condition based on input quality of condition.

24. From the Select/Limit category of function blocks, select the HLL function block.

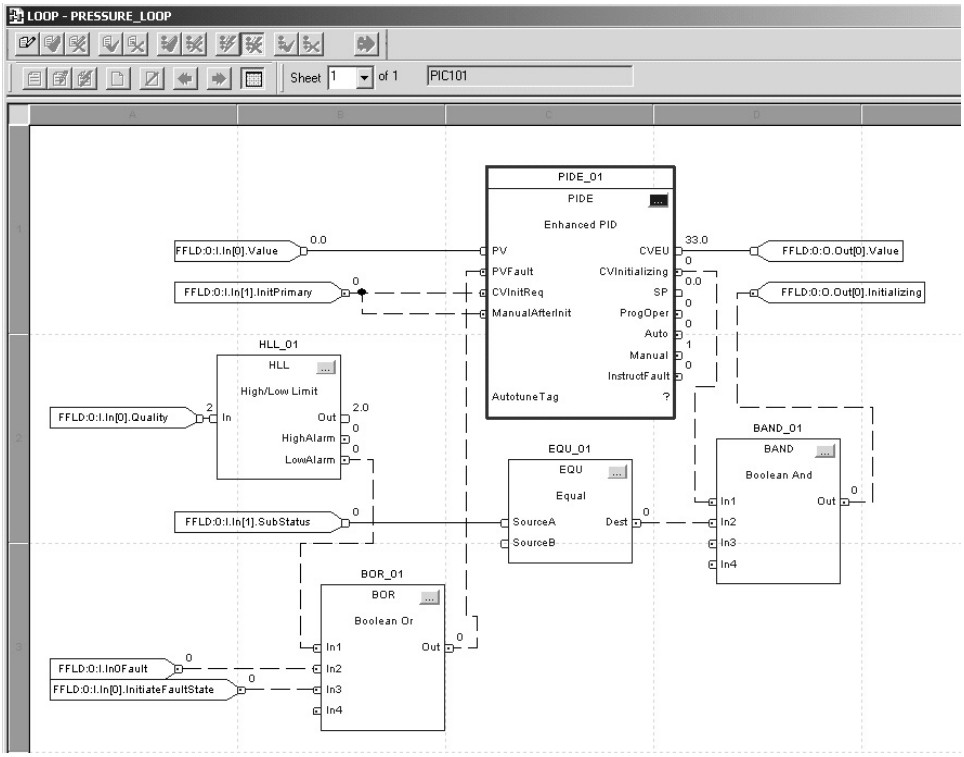
25. Wire the "LowAlarm" output of the HLL function to the In1 of the BOR function block.

26. Wire "FFLD:0:I.In[0].Quality" using an input reference connector to the In input parameter of the HLL function block.

27. Edit the HLL function block so that the HighLimit is 4.

    This function block will evaluate the quality signal of the fieldbus data and send a true signal if the quality association is BAD; 0.

28. The wired function block and the entire strategy should look similar to this.



29. In the Menu Bar, click Communications ⇒ Select Who Active.

30. Navigate to your controller and click Set Project Path.

31. Click Close.

32. Click the Mode button and select Go Online.

33. On the Connected to Go Online window, click Download.

34. Click Download to acknowledge the warning.

The Downloading window shows the download progress.

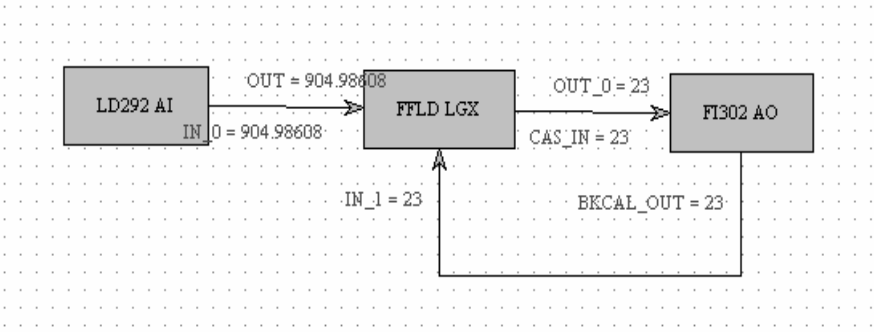
35. Click Yes to change the controller to Remote Run mode.

The I/O OK is Solid Green.

If the I/O OK light is blinking green, the IP address may be wrong, or the Slot number does not match the Slot number in RSFieldbus.

Test the PID Loop

1. Click the Mode button and select Program Mode.
2. Click the PIDE Block Properties button ....
3. Edit the PIDE, which is currently in manual mode, to output a value by changing the CVOoper value, and click OK.
4. In RSFieldbus, go online to view the changes caused by the previous change.



5. Exercise the loop and verify the operations.
6. Edit the PIDE instruction for automatic operations with appropriate tuning parameters.
7. Exercise the loop by changing either the Set Point or the AI value.

Device Replacement

Foundation Fieldbus supports interoperability, but not necessarily interchangeability. Interoperability means that devices can communicate with each other on a common basis. Interchangeability means that devices can not only communicate with each other on the same basis, but can replace each other with minimum effort (similar to replacing 4 – 20 mA transmitters for process sensing).

Since Foundation Fieldbus is a communication protocol with manufacturer specific function blocks, there is no guarantee that one manufacturer's function blocks will operate in a similar manner as another's. Therefore, reuse of one manufacturer's function block in another manufacturer's device is to be avoided.

Interoperability

If a device is to be replaced with another manufacturer's device, or a device from the same manufacturer but from a different model series, this replacement falls under the category of interoperability.

Interoperability will require a complete recreation of the control strategy function blocks in the failed unit. The existing blocks in the failed unit need to be deleted and then replaced by appropriate function blocks in the existing strategy. The resulting strategy will then require a complete download of the entire network.

Interchangeability

Interchangeability is the ability to replace one failed device with a good device, provided that the devices are from the same manufacturer and class. In this case, replacement can be accomplished by moving blocks from the failed device to the replacement device. The replacement device can then be downloaded without any need to edit the strategy or download the entire network.

If interchangeability is an option, there are two possible ways of accomplishing it:

Replacing an Interchangeable Device

1. Physically connect the replacement device to the H1 network.
2. Right-click the failed device in H1 network and select Attributes.
3. In the Device Attributes window, use the drop-down selection for Device Id to locate the new device.
4. Once the new device is selected, click OK.
5. Right-click the device again and select Download.

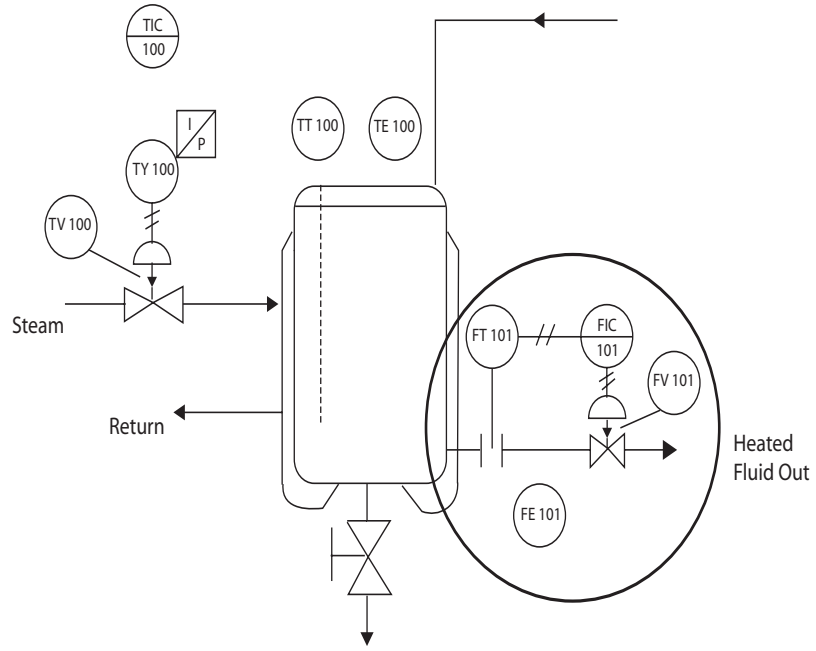
Replacing a Device of the same class

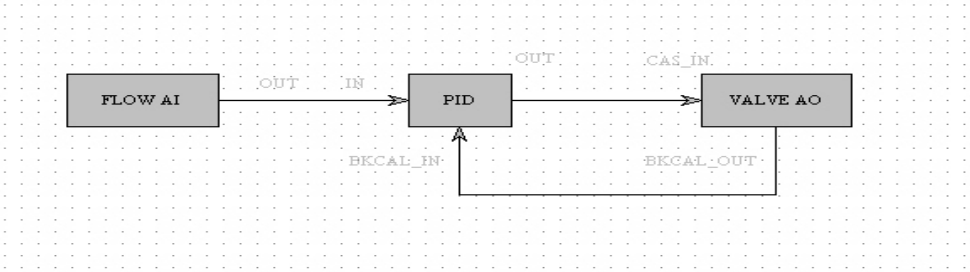
1. Physically connect the replacement device to the H1 network.
2. Create the replacement device in the RSFieldbus H1 network.
3. Right-click the replacement device in the H1 network and select Attributes.
4. In the Device Attributes window, use the drop-down selection for Device Id to locate the new device.
5. Once the new device is selected, click OK.
6. Create a Resource and Transducer block for the replacement device.
7. From the failed device, drag the function blocks in that device, with the exception of the resource and transducer blocks, and drop them in the replacement device.
8. Right-click the replacement device again and select Download.
9. Delete the failed device.

PID Guide

Below are several diagrams of PID formations, as well as tables listing their components

Simple PID:



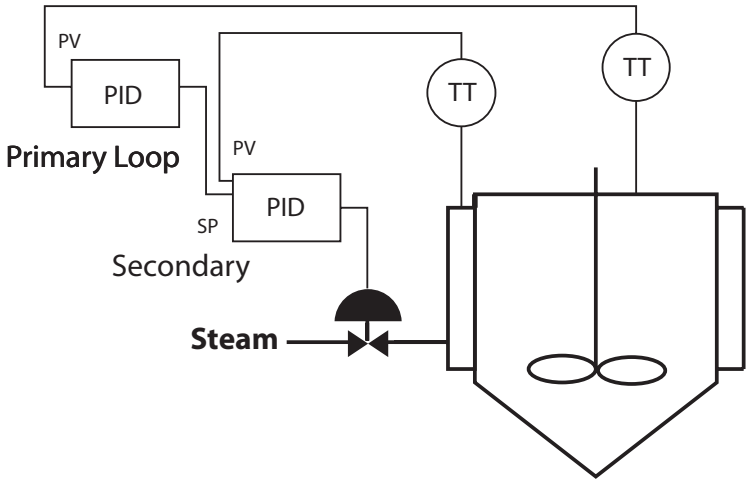


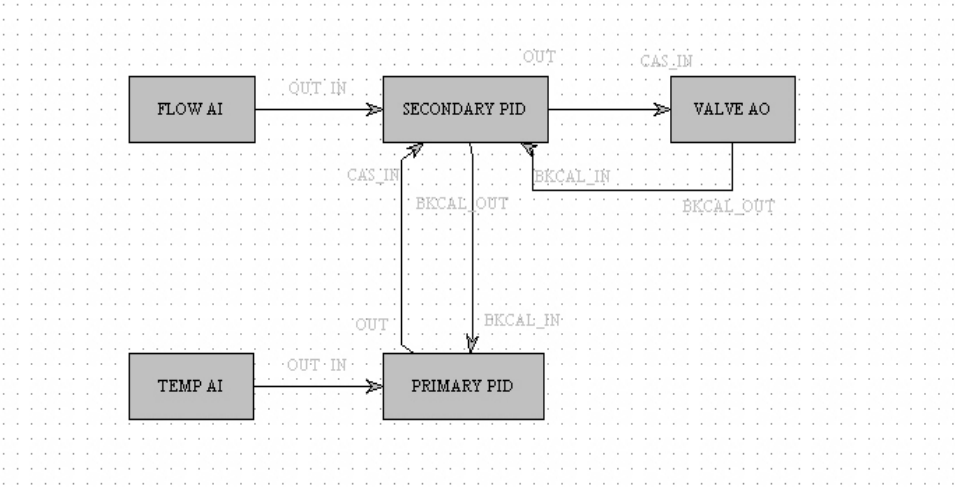
Simple PID Logic

Block	Block Type	Parameter	Element	Value
FLOW	Analog Input	MODE_BLK	TARGET	Auto
		XD_SCALE (these values must match the PRIMARY_VALUE_RANGE of the transducer block)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct

Block	Block Type	Parameter	Element	Value
PID	PID	MODE_BLK	TARGET	Auto
		GAIN		Loop Dependent
		RESET		
		RATE		
		PV_SCALE (these values must match in Analog Input range)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
VALVE	Analog Output	MODE_BLK	TARGET	CAS
		XD_SCALE (these values must match the FINAL_VALUE_RANGE of the transducer block)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct

Cascade PID



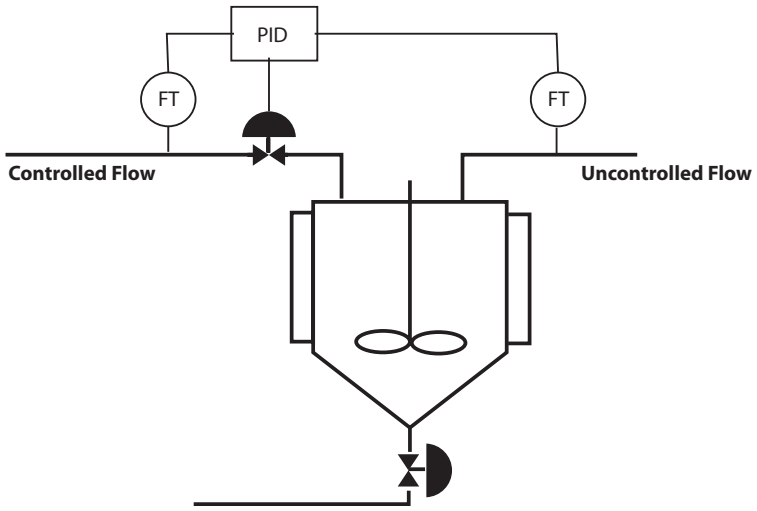


Cascade PID Logic

Block	Block Type	Parameter	Element	Value
FLOW	Analog Input	MODE_BLK	TARGET	Auto
		XD_SCALE (these values must match the PRIMARY_VALUE_RANGE of the transducer block)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct
Secondary PID	PID	MODE_BLK	TARGET	CAS
		GAIN		Loop Dependent
		RESET		
		RATE		
		PV_SCALE (these values must match in Analog Input range)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
TEMP	Analog Output	MODE_BLK	TARGET	Auto
		XD_SCALE (these values must match the PRIMARY_VALUE_RANGE of the transducer block)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct

Block	Block Type	Parameter	Element	Value
Primary PID	PID	MODE_BLK	TARGET	Auto
		GAIN		Loop Dependent
		RESET		
		RATE		
		PV_SCALE (these values must match in Analog Input range)	EU_100	
			EU_0	
			UNITS DECIMAL	
			DECIMAL	
VALVE	Analog Output	MODE_BLK	TARGET	CAS
		XD_SCALE (these values must match the FINAL_VALUE_RANGE of the transducer block)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct

Ratio PID

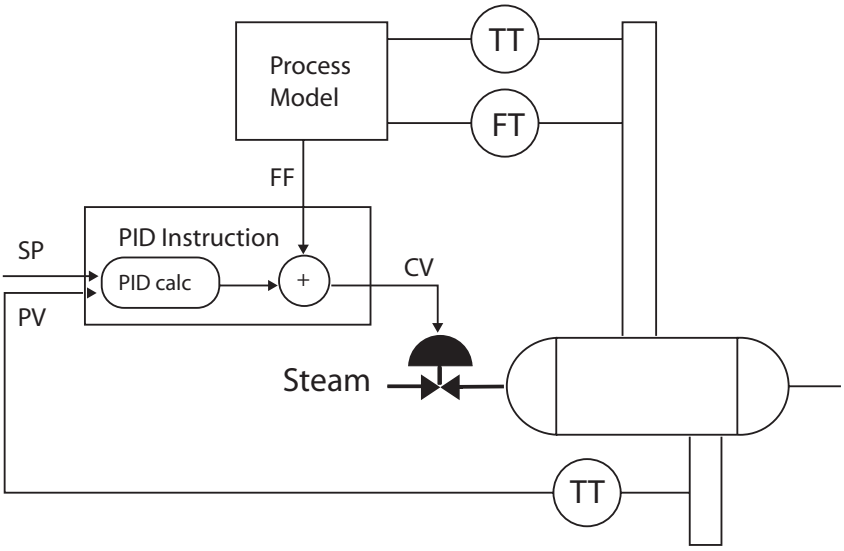


Ratio PID Logic

Block	Block Type	Parameter	Element	Value
CON FLOW	Analog Input	MODE_BLK	TARGET	Auto
		XD_SCALE (these values must match the PRIMARY_VALUE_ RANGE of the transducer block)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct
PID	PID	MODE_BLK	TARGET	CAS
		GAIN		Loop Dependent
		RESET		
		RATE		
		PV_SCALE (these values must match in Analog Input range)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
UNC FLOW	Analog Output	MODE_BLK	TARGET	Auto
		XD_SCALE (these values must match the PRIMARY_VALUE_ RANGE of the transducer block)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct
RATIO	Arithmetic	MODE_BLK	TARGET	Auto
		ARITH_TYPE		Traditional summer
		GAIN		ratio
		IN_1	STATUS	GNC
		IN_2	STATUS	GNC
		IN_3	STATUS	GNC

Block	Block Type	Parameter	Element	Value
VALVE	Analog Output	MODE_BLK	TARGET	CAS
		XD_SCALE (these values must match the FINAL_VALUE_RANGE of the transducer block)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct

Feed Forward PID



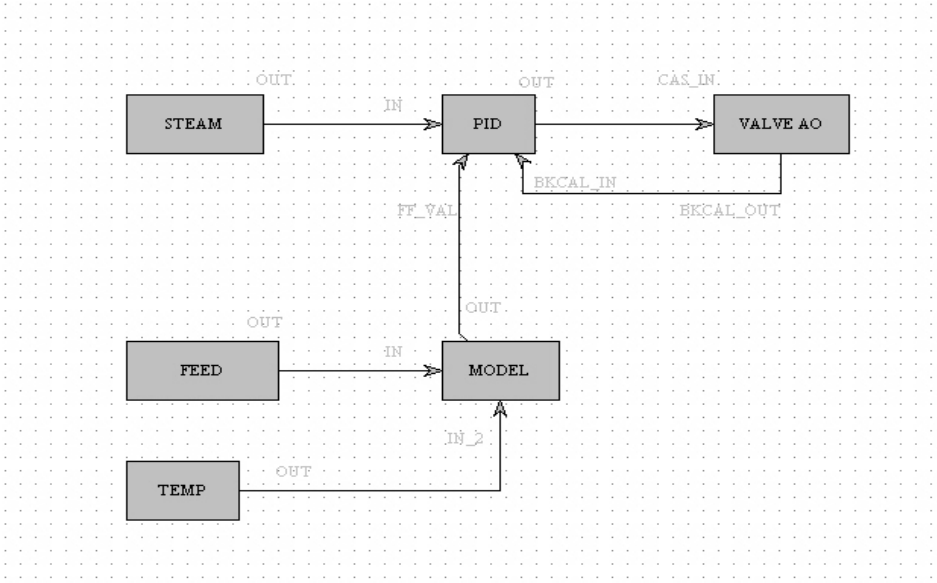


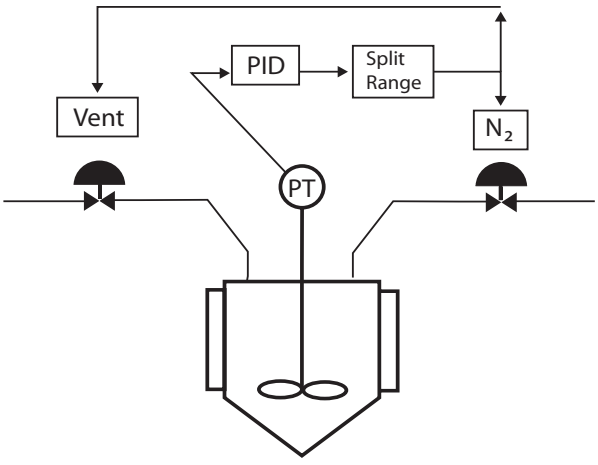
Table 4.1 Feed Forward PID Logic

Block	Block Type	Parameter	Element	Value
STEAM	Analog Input	MODE_BLK	TARGET	Auto
		XD_SCALE *	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct
PID	PID	MODE_BLK	TARGET	CAS
		FF_GAIN		1.0
		GAIN		Loop Dependent
		RESET		
		RATE		
		PV_SCALE (these values must match in Analog Input range)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
FEED	Analog Output	MODE_BLK	TARGET	Auto
		XD_SCALE *	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct
TEMP	Analog Input	MODE_BLK	TARGET	Auto
		XD_SCALE *	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL	STATUS	1
		L_TYPE		Direct

Block	Block Type	Parameter	Element	Value
MODEL	Arithmetic	MODE_BLK	TARGET	Auto
		ARITH_TYPE **		Average
		GAIN **		4.0
		IN_1 **	VALUE	Negative of expected flow
		IN_1 **	STATUS	GNC
		IN_3 **	VALUE	Negative of expected temp
		IN_3**	STATUS	GNC
VALVE	Analog Output	MODE_BLK	TARGET	CAS
		XD_SCALE *	EU_100	
			EU_0	
			UNITS DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct

** These values must match the PRIMARY_VALUE_RANGE of the transducer block*
*** User defined values. These represent the suggested use for this application.*

Split Range PID



Split Range PID Logic

Block	Block Type	Parameter	Element	Value
PRESSURE	Analog Input	MODE_BLK	TARGET	Auto
		XD_SCALE *	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct
PID	PID	MODE_BLK	TARGET	CAS
		GAIN		Loop Dependent
		RESET		
		RATE		
		PV_SCALE (these values must match in Analog Input range)	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
SPLIT	Splitter	MODE_BLK	TARGET	CAS
		IN_ARRAY **		0,48,50,100
		OUT_ARRAY **		100,0,0,100
VENT	Analog Output	MODE_BLK	TARGET	CAS
		XD_SCALE *	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct
N2	Analog Input	MODE_BLK	TARGET	CAS
		XD_SCALE *	EU_100	
			EU_0	
			UNITS_DECIMAL	
			DECIMAL	
		CHANNEL		1
		L_TYPE		Direct

Troubleshooting

In This Chapter

Manufacturer's Documentation

Most manufacturers of fieldbus devices and components offer product-specific support documentation in some form, whether it be online or in print. When experiencing difficulties with these elements, it is recommended that you use the specific documentation provided by individual manufacturers.

Troubleshooting Guide

This guide illustrates a number of known fixes to problems you may encounter while using RSFieldbus. Before you call Technical Support, please see if your symptoms match any of the following:

Symptom	Possible Problem	Solution
Cannot communicate with the linking device and the STATUS LED is flashing green.	The linking device's IP address is not established.	Refer to Assigning an IP Address in the linking device Installation Instructions, publication 1757-IN021.
Cannot communicate with the linking device and the STATUS LED is solid green.	IP address is configured but unknown.	Use RSLinx (Ethternet_IP driver) to browse the local subnet.

Symptom	Possible Problem	Solution
The IP address does not appear in RSLinx or the RSFieldbus Live List and it is needed.	Your computer's subnet mask is not compatible to the linking devices' subnet mask.	1. Go online in RSFieldbus to launch the RSHSE OLE Server. 1. Click the RSHSE OLE Server button in you Windows toolbar. This opens a list of linking devices that are broadcasting their IP addresses. If the linking device in question does not appear in the list, refer to Assigning an IP Address in the linking device Installation Instructions, publication 1757-IN021. 1. Change the IP settings for your computer so that the subnet mask is compatible to the linking devices' subnet mask. 1. Once the subnet masks are compatible, refer to Assigning an IP Address in the linking device Installation Instructions, publication 1757-IN021.
H1,2,3,4 LEDs are off.	An ethernet connection is not established between the Host computer and the linking device.	• Configure the linking device IP address per the 1757-FFLD Installation Instructions, publication 1757-IN021. • Or, cycle power on the linking device.
	Another Link Master is active on the network and it is not sending a probe node to the linking device.	Powercycle or reset the other device so that the linking device can take over as LAS.
	IP address is is not configured or the DHCP server is not found.	Refer to Assigning an IP Address in the linking device Installation Instructions, publication 1757-IN021.
H1,2,3,4 LEDs are blinking, more off than on.	Another device on the network is the LAS.	• If everything is working properly, this can be ignored. • Or, configure the other device to be Basic and/or remove its Primary Link Master setting. • Or for a temporary fix, power cycle the other device so that the linking device can take over as LAS.

Symptom	Possible Problem	Solution
A Red X is on the linking device in the HSE/H1 window.	The Device Id may not be associated in the linking device's attributes.	Refer to Initialize Communications and Associate the FFLD on page 4-23.
A Red X is on a fieldbus device in the H1 window.	The Device Id may not be associated in the Device's attributes.	Refer to Initialize Communications and Associate the FFLD on page 4-23.
Online characterization doesn't show any real-time values.	Strategy is not downloaded.	Download the devices associated with the strategy. Refer to Download the Configuration on page 4-37.
	Tags are not exported.	Refer to Export Tags on page 4-37.
Online CM monitor parameter tags are gray and have no values.	Tags are not exported.	Refer to Export Tags on page 4-37.
Unable to download after adding new device to an existing strategy.	Macro-Cycle value on H1 network may be too low.	Increase the macrocycle time on the H1 network(s). Refer to the Macrocycles section of the RSFieldbus User Manual, publication RSFBUS-UM001A-EN-E.
Red Links on the Strategy after a successful download.	Links are not properly established.	Update H1 device and re-download device. To update a device, right-click it and select Update.
Download error	Communication error	Update H1 device associated with error message and redownload the device. Update H1 device and re-download device. To update a device, right-click it and select Update.
Schedule download failure	Communication error	Right-click the H1 and select Download Schedule.
Logix block inputs and outputs are red.	CLX is not in run mode.	Put the CLX in Run Mode.
Yellow triangles on Logix blocks in the I/O tree in RSLogix.	Mismatched SLOT number	Match the SLOT number in the Logix block with configuration in CLX. Refer to Add Your Logix Block on page 4-45.
NS LED blinking green	Communication not configured on RSLogix or RSFieldbus	Refer to Configure Communication Settings on page 4-23.
Assign tag failure	Communication error	Verify tag assignment. Refer to Assign Tags on page 4-27.
"Capabilities File Information missing" error message	Device revision/ DD revision mismatch	Verify proper device revision/DD revision selections. Right-click the corresponding icon and select Attributes.

Poor Fieldbus Signals

Poor signal quality can inhibit the optimization of your fieldbus network. Below is a list of common causes for poor signal quality:

Cause of Poor Signal	Result
Wrong type of cable	Can attenuate the signal below the low AC cutoff limits. Also, this could lead to cable length being too long.
Too long of H1 segment	Tends to attenuate the signal below the low AC cutoff limit by inducing inductance. Also, the length, along with the number of devices, can create a power problem.
Missing terminators	Causes ringing, which will enlarge the signal outside the high AC cutoff limits.
Grounded /shorted signal wires	Causes the signal to be 0 volts.
Bad terminator or junction block	Can ground/short/load the signal which will cause the signal to be low or 0 Volts.
Improper shielding	Causes shorts with signal wire, which will cause the signal to be 0 volts. Dressing shields with shrink-wrap will prevent this situation!
Bad device or transmitter	Causes short or load down the H1 segment.
Bad connectors	Can drop transmitters off the H1 network intermittently or permanently.
Too many devices, which combined use too much current on a H1Segment	Reduces the voltage below 9 V DC because the power supply or power conditioner cannot supply enough power to the H1. Also results in small power dips from the AC supply. Ideally, the system should be kept at 11 to 12 VDC at the lowest so that there is some safety margin for the devices in the event of a poor power condition.
The power supply supplies too much voltage	Can shut down devices or damage them, make sure your power supply with the conditioner only supplies 32 V DC out of the conditioner output terminals.
Noisy power supply	Causes data loss and reset of devices when the low 9 V DC cutoff is reached.

What To Do if the Linking Device Does Not Appear in the HSE Live List

The following is a list of steps that can be taken if you are having problems getting the linking device to appear in the HSE Live List:

Are the Linking Device's LEDs On?

No:

a. Verify that the linking device's power connector is properly connected to the power supply. See the linking device's installation instructions for directions.
b. Verify that the power supply is properly connected to the AC power.
c. Verify that the proper DC voltage is present at the linking device's power connector.
d. If the linking device's LEDs are still off call Tech Support.

Is the Linking Device Connected to a Hub or Directly?

Hub:

Is the Link LED active for the linking device? Is the Link LED active for the PC Host?

a. Replace the cable between the hub and the device that does not have an active Link LED.
b. Replace the hub.

Direct:

Is the proper crossover cable being used?

a. Verify that the crossover cable is correct.

Is the Link LED at the PC Host Ethernet connector on?

a. Verify that the Ethernet port on the PC Host is active.
b. Verify that the cable is properly connected.

Is the Link LED at the linking device Ethernet connector on?

a. Verify that the cable is properly connected to the linking device.

Can the PC Host "Ping" Itself?

No:

a. Verify that the TCP/IP protocols are installed in Windows.
b. Verify that the "Local Connection" is active.

Can the Linking Device Be "Pinged" From the PC Host?

Yes:

a. Go to step "Does RSLink in the AB_ETHIP driver see the linking device when RSWho is running?"

Are the Linking Device and the PC Host on the Same Sub-Net?

No:

Linking Device IP address: XXX.YYY.ZZZ.abc

PC Host IP address: XXX.YYY.ZZZ.def

a. In most cases, the linking device and the PC Host must be on the same sub-nets. That is the XXX.YYY.ZZZ portion of the IP address must match.
b. If you don't know or cannot set the IP address of the linking device using the DHCP/BootP server, call tech Support.
c. Change the IP address of the PC Host to match the sub-net of the linking device.

Does RSLinx in the AB_ETHIP Driver See the Linking Device When RSWho is Running?

No:

a. Verify that the AB_ETHIP-1 driver is properly configured.
b. Call Tech Support

Is the RSFieldbus Project Properly Configured?

Don't know:

a. Refer to Create A New RSFieldbus Project on page 4-14 and configure a project, or use a known good project file to test the operation of the linking device on HSE. If this does not work, contact Tech Support for assistance in building a proper project file.

Yes:

a. Remove power from the linking device.
b. On the top of the linking device, move the jumper to the left-most contact position then back to the right-most contact position.
c. Close RSFieldBus.

d. On the PC Host in the c:\Program Flies\Rockwell Software\RSFieldbus\OLEServers\ directory delete the IDShellHSE.bin file.

e. Restart RSFieldBus.

f. Load your project.

g. Apply power to the linking device. Allow the linking device to completely start up as indicated by the H1 channel activity LEDs blinking.

h. Go online in RSFieldBus and monitor the HSE Live List. The linking device should now be visible.

i. If the linking device is still not visible in the HSE Live List, contact Tech Support.

What To Do if The Linking Device Does Not Appear in the H1 Live List

Does the linking device appear in the HSE Live List?

No:

a. Go to What To Do if the FFLD Does Not Appear in the HSE Live List on page 5-5.

Yes:

a. Close the H1 live List window.

b. Close the H1 network window.

c. Reopen the H1 network window.

d. Reopen the H1 Live List window.

Does the Linking Device appear in the H1 Live List Now?

Yes: Done.

Is the Linking Device Connected to the Network?

No:

a. Connect the linking device to the network following the instructions in the Foundation Fieldbus Installation Guide.

Or:

a. Verify that the network connections are correct on the linking device connector.

b. Verify that the network cable is connected to the network and that the polarity is correct.

c. Verify that there are **two** and only two terminators on the network.

Is There Power on the H1 Network?

No:

a. Connect a power supply to the network.

Is the Power Supply Connected Through a Proper Power Conditioner?

No:

a. Use a proper power conditioner in accordance with the Foundation Fieldbus Installation Guide.

Power must be applied to the network through a proper power conditioner. The power supply **cannot** be directly connected to the H1 network.

Is There Network Power on the Linking Device Network Connector?

No:

Is There Power on the Terminal or Network Connector Block/Power on the Output on the Power Conditioner?

No:

a. Repair or replace the power conditioner.

Is the Voltage at the Output of the Power Conditioner 11-30 VDC?

No:

a. Repair, replace or adjust the power supply.

Is the RSFieldbus Project Properly Configured?

Don't know:

a. Refer to Create A New RSFieldbus Project on page 4-14 and configure a project or use a known good project file to test the operation of the linking device on the H1 network. If this does not work, contact Tech Support for assistance in building a proper project file.

Yes:

a. Remove power from the linking device.

b. On the top of the linking device, move the jumper to the left-most contact position then back to the right-most contact position.
c. Close RSFieldBus.
d. On the PC Host in the c:\Program Flies\Rockwell Software\RSFieldbus\OLEServers\ directory delete the IDShellHSE.bin file.
e. Restart RSFieldBus.
f. Load your project.
g. Apply power to the linking device. Allow the linking device to completely start up as indicated by the H1 channel activity LEDs blinking.
h. Go online in RSFieldBus and monitor the H1 LiveList.
i. The linking device should now be visible.

Does the Linking Device Appear in the H1 Live List Now?

Yes: Done

Are There any Other H1 Devices on the Network?

No:

a. Contact Tech Support.

Or:

a. Disconnect any other H1 devices from the network.

Does the Linking Device appear in the H1 Live List Now?

No:

a. Contact Tech Support.

Or:

a. Manually resolve address or BOF class conflicts between the other devices and the linking device.
b. Re-connect the devices to the network.

Does the Linking Device Now appear in the H1 Live List Now?

Yes: Done.

No:

a. Call Tech Support.

What To Do if the Linking Device Blinks On and Off in the H1 Live List

Is The Linking Device Properly Connected to the Network?

a. Verify that there are **two** and only two terminators on the network.
b. Verify that the polarity of the network cabling is consistent (i.e. red to red and black to black).
c. Verify that the network voltage is between 11 and 30 VDC.

Are There Any Other Devices on the H1 Network?

Yes:

Disconnect any other devices from the network:

a. Remove power from the linking device.
b. On the top of the linking device move the jumper to the left-most contact position then back to the right-most contact position.
c. Close RSFieldBus.
d. On the PC Host in the c:\Program Flies\Rockwell Software\RSFieldbus\OLEServers\ directory delete the IDShellHSE.bin file.
e. Restart RSFieldBus.
f. Load your project.
g. Apply power to the linking device. Allow the linking device to completely start up as indicated by the H1 channel activity LEDs blinking.
h. Go online in RSFieldBus and monitor the H1 LiveList.

Does the Linking Device Appear in the H1 Live List Now?

No:

a. Contact tech Support.

Or:

a. Re-connect the individual nodes one at a time.
b. As each device is connected, verify the device appears in the H1 Live list and that the linking device remains in the H1 live list.

Do All Devices and the Linking Device Appear in the H1 Live List?

Yes: Done.

No:

a. Contact Tech Support.

Or:

There is only the linking device on the network:

a. Remove power from the linking device
b. On the top of the linking device, move the jumper to the left-most contact position then back to the right-most contact position.
c. Close RSFieldBus.
d. On the PC Host in the c:\Program Flies\Rockwell Software\RSFieldbus\OLEServers\ directory delete the IDShellHSE.bin file.
e. Restart RSFieldBus.
f. Load your project.
g. Apply power to the linking device. Allow the linking device to completely start up as indicated by the H1 channel activity LEDs blinking.
h. Go online in RSFieldBus and monitor the HSE LiveList.

Does the Linking Device Appear in the H1 Live List Now?

Yes: Done.

No:

a. Contact tech Support.

What To Do if You are Unable to See Parameter Values in the Function Block Online Characterization

a. Verify that tags have been exported.
b. Export Tags.
c. Verify that the HSE download has completed.
d. Do an HSE download.
e. Verify that the H1 download has completed.
f. Do an H1 network download.

Are the Parameter Values Displayed Now?

Yes: Done

No:

a. Perform an **UPDATE** command on the device.

Are the Parameter Values Displayed Now?

Yes: Done

No:

a. Save the project.
b. Close the project.
c. Close RSFieldbus.
d. Verify that the RSFieldbus servers close.
e. End the servers execution if not closed.
f. On the PC Host in the c:\Program Flies\Rockwell Software\RSFieldbus\OLEServers\ directory delete the IDShellHSE.bin file.
g. Start RSFieldbus.
h. Load the project file.
i. Go online.
j. Do online characterization for a function block.

Are the Parameter Values Displayed Now?

Yes: Done.

No:

a. Remove power from the linking device
b. On the top of the linking device move the jumper to the left-most contact position then back to the right-most contact position.
c. Apply power to the linking device. Allow the linking device to completely start up as indicated by the H1 channel activity LEDs blinking.
d. Go online in RSFieldbus
e. Perform an HSE download
f. Perform an H1 download.
g. Do online characterization for a function block.

Are the Parameters Values Displayed Now?

Yes: Done.

No:

a. Contact Tech Support.

Third Party Device Information

The following table lists qualified devices for use with the linking device.

Manufacturer	Catalog Number	Firmware Revision	DD Revision
Anderson Instr.	Temperature Trans	1	010101.cff 2003,04,08 cffversion 1.5
Anderson Instr.	PRESSURE TRANS	NA	NA
EIM Controls	Electric Actuator M2CP	2.00.32	010101.cff 2001,4,10 cffversion 1.5
Emerson	2100 FieldQ	NA	NA
Endress + Hauser	FMR 240	1.02	020201.cff 2001,03,15 cffversion 1.5
Endress + Hauser	Prosonic M FMU 40	3	030101.cff 2002,03,07 cffversion 1.5
Endress + Hauser	Cerabar S PMC 731	2	020101.cff 2001,11,30 cffversion 1.5
Endress + Hauser	Promag 53 P	2	020101.cff 2001,10,19 cffversion 1.5
Endress + Hauser	Levelflex M FMP 40	3	030101.cff 2002,03,07 cffversion 1.5
Endress + Hauser	DeltaBar S	2	020101.cff 2000,11,30 cffversion 1.5
Endress + Hauser	ITEMP	4/3.45	040102.cff 2000,07,26 cffversion 1.5
Endress + Hauser	Prosonic Flow 93	1	010101.cff 2001,10,19, cffversion 1.5
Endress + Hauser	DeltaPilot S	1	010101.cff 2000,11,19, cffversion 1.5
Endress + Hauser	Promass 83 F	2	020101.cff 2001,10,19 cffversion 1.5
Flowserve	Logix 1410	1.51	FC0101.cff 2003,09,11
Foxboro	RTT 25	REV D	020201.cff 2002,12,10 cffversion 1.5
Foxboro	IASPT10	22	160101.cff 2003,04,01 cffversion 1.5
Honeywell	STT 35F	2	020101.cff 2000,10,12 cffversion 1.5
Honeywell	STG 140	4.01	080101.cff 2000,08,16 cffversion 1.5
Micro Motion	2700 Flowmeter	NA	NA
OVAL Corporation	Delta Flowmeter	1	010101.cff 2000,9,28 cffversion 1.5
Pepperl+Fuchs	FDO-VC-Ex4.FF	1.1	010101.cff 2000,08,14, cffversion 1.5
Rosemount	3244MV	4.01.003	040101.cff, 2001,3,26 cff version 1.5
Rosemount	3051T	2.5.7	070201.cff 2001,2,08 cffversion 1.5
Rosemount	3051S REV 20	20	140204.cff 2002,11,07 cffversion 1.5
Rosemount	8742 Flowmeter	4.1	NA
Rosemount	848T	pending	pending
Rosemount	8742C	4	040105.cff (see comments)
Rosemount Analytical	5081pH/ORP	1.00.005	010101.cff 2002,11,05 cffversion 1.5
SMAR	TT 302	3.4.6D	040201.cff 2002,12,05 cffversion 1.5
SMAR	LD-292	3.4.6 D	040201.cff 2002,17,05 cffversion 1.5
SMAR	DC302	3.5	050201.cff 2003,01,07 cffversion 1.5
Westlock	7344-MPT	1.1.3	010101.cff 2001,10,2 cffversion 1.5
Westlock IcoT	1100	1	010101.cff 2003,01,24 cffversion 1.5

Manufacturer	Catalog Number	Firmware Revision	DD Revision
Yamatake	ATT 60	1.00.07	010201.cff 2002,11,12 cffversion 1.5
Yamatake	AVP303	NA	NA
Yamatake	STD920	NA	NA
Yokogawa	YTA320(std)	R1.05	020101.cff 2000,08,01 cffversion 1.5
Yokogawa	YTA320(LC2)	R1.01	020101.cff 2000,08,01 cffversion 1.5
Yokogawa	YVP110	NA	NA

RSFieldbus Remote Access

This appendix shows two scenarios for remotely accessing RSFieldbus tags and software.

In the first scenario, RSFieldbus is located on a Local Server and RSView SE is located on a Remote Client. RSView SE accesses the tags from the RSFieldbus OPC database for the purpose of displaying information and controlling the process.

In the second scenario, RSFieldbus is on a local machine and another instance of RSFieldbus is on a remote machine, which is temporarily connected to the network. The remotely located RSFieldbus accesses the local version of RSFieldbus for the purpose of editing and creating strategies. In either case, permissions need to be made via DCOM settings to allow access.

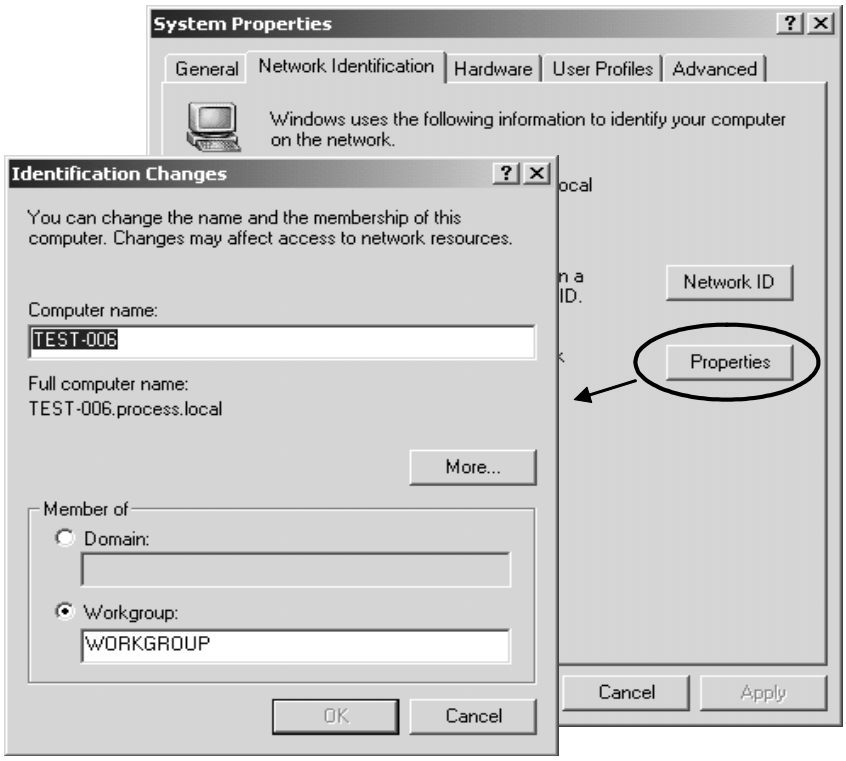
System Criteria

- All RSFieldbus tags contain no spaces
- RSFieldbus must be installed on both the Server and the Client
- The machines are in a Workgroup
- Security settings are set to the minimum
- If the machine is on a domain, the domain PS_USER account must be added to the local Administrators group

Network Setup

- The network must be isolated with IP addresses assigned statically. If the machine is on a domain, use the "Obtain an IP address automatically" option.

- Both machines must be members of the same workgroup. If working in a domain environment, ensure that the machines are on the same domain. For further information, see the system administrator.

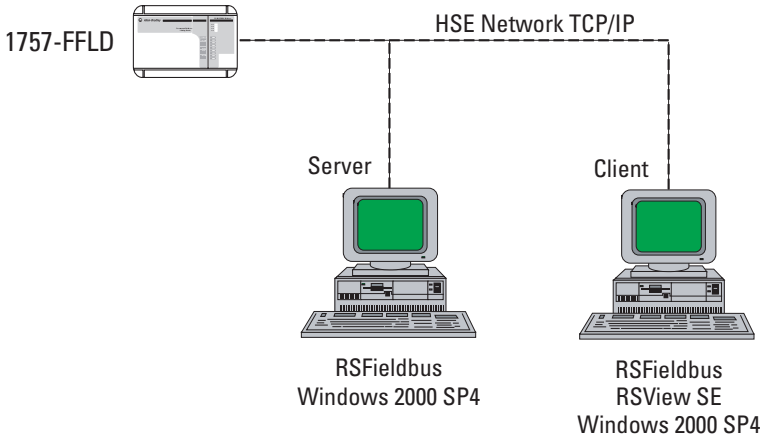


- In a workgroup environment, both machines must use the same user name and password. Passwords are case sensitive and must be exact in both machines. The machines must be logged on to these accounts. In a domain environment, both machines must use the domain user accounts.

  All accounts being used must have administrative rights in order to successfully connect.

Remote RSView SE OPC Access

The architecture for this scenario is shown below. While this can be performed on both Windows 2000 and XP, this scenario is completed in Windows 2000.



You must perform two different configurations to be able to connect through DCOM: the Client-side and the Server-side.

Server and Client DCOM Settings

Complete the following on both the Server and the Client.

1. Click Start ⇒ Run.
2. In the Open field, enter <dcomcnfg> and click OK.
3. Select the Default Properties tab and select the following:
   a. Enable Distributed COM on this computer
   b. Default Authentication Level: **Connect**
   c. Default Impersonation Level: Identify
4. Select the Default Security folder and click Edit Default under Default Access Permissions.

5. Change the Type of Access to Allow Access for the following:
   a. Servers and Clients - Administrator, Everyone, INTERACTIVE, SYSTEM
   b. Domain Clients - (Server computer name)\Administrators, Domain Users, NETWORK
   c. Domain Servers - (Client computer name)\Administrators, Domain Users, NETWORK

6. Click OK.

7. Repeat steps 5–6 for the Default Launch Permissions.

8. Select the Applications tab and double-click Rockwell Software OPC & Conf Server for HSE.

9. Select the Location tab and complete the following:
   a. Check the Run application on this computer check box.
   b. For Clients, check the Run application on the following computer check box and click Browse to locate the Server name on the network.
      This allows the Client to use the service on the Server.
      If you are unable to browse for the Server, verify that you can PING the Server by IP address and name.

10. Select the Security tab and verify that access and launch permissions are set to default.

11. Select the Identity tab.
    a. For Servers, select The interactive user.
    b. For Clients, select The launching user.

12. Click OK on the Rockwell Software OPC & Conf Server for HSE Properties and the Distributed COM Configuration Properties windows.

Verify RSView Remote Access

To verify that the settings are correct, create a graphic in the Client machine, which has the RSView software installed. When you attempt to change a parameter of function block that is loaded and in operation, you should observe the following:

1. When the RSView Client attempts to connect to the RSFieldbus Server, it will launch the RS HSE OLE Server and the RS DD Server, which appear in the system tray of the Local Server. The launching of these servers can be also verified by observing the appearance of RSddserver.exe and RSHseServer.exe in Task Manager (if they were not running initially).

2. You should be able to change the MODE of a function block using a numeric entry. The function block parameters have a numeric association that may not be available to the user. The online characterization of a function block within RSFieldbus can be used to provide the hex numeric data. You can display the hex value association by toggling the Show value as symbol button located in the On line Characterization window.

3. When the RSView Client attempts to disconnect from the RSFieldbus Server, it will stop the RS HSE OLE Server and the RS DD Server, which will be removed from the system tray of the Local Server (if they were not being actively used by the RSFieldbus Server for online monitoring).

Define the OPC Server on RSView Studio

1. On the remote machine, select Start ⇒ Programs ⇒ Rockwell Software ⇒ RSView Enterprise ⇒ RSView Studio.

   The Licensing System Information window shows how many Blocks are licensed on your system.

2. At the Product Type Selection window, select SE Stand-alone for non-domain machines or SE Distributed for domain-based machines.

3. Click Continue.

   The New/Open SE Stand-alone Application window opens.

4. On the New tab, enter an application name click Create.

   RSView Studio opens.

5. On the RSView Studio menu bar, click File ⇒ New ⇒ OPC.

   An OPC DATA Server Properties window opens.

6. In the Name field, enter >RSFieldbus<.

7. Select Server will be hosted on remote computer and click Browse to find the Server.

8. Select the Server and click OK.

9. At the OPC Server name (ProgID) field, click Browse to find the OPC Server running on the Server machine.

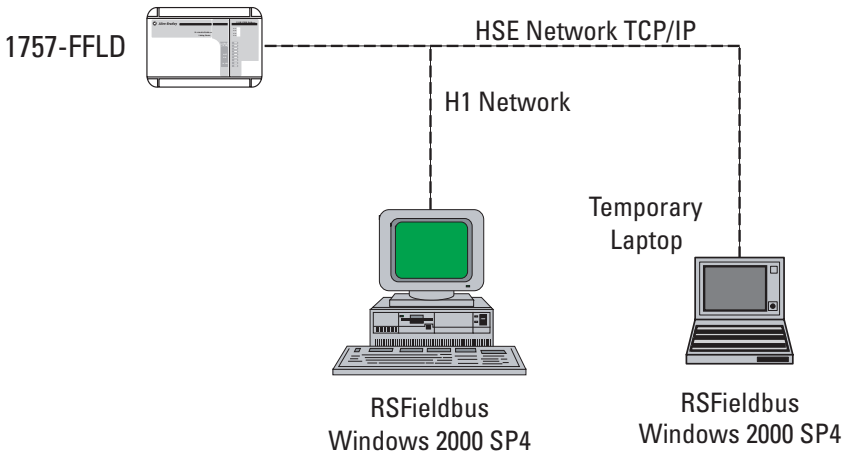
10. Select the Rockwell Software OPC & Conf Server and click OK.

11. Click OK to close the Properties window.

    The computer attempt to establish a connection, and the message window at the bottom of RSView Studio indicates progress.

Remote RSFieldbus Configuration Access

The architecture for this case is shown below.



The laptop is a temporary connection to the network whose sole purpose is to update the control strategy.

DCOM Settings

Following the instructions in Server and Client DCOM Settings on page 3 to set up the desktop as the Server and the laptop as the Client.

Before you Begin

- Verify that the Program Files folder on the Local Server is set up for sharing.
- Verify that the same DDs exist on both the Local Server and the Remote Client.

Remote Access

In this scenario your are using a project, created and stored on the Local Server, and opening it on the Remote Client (laptop).

1. From the RSFieldbus main window on the Remote Client, select Project File ⇒ Open and browse to the Local Server.
2. Select the project and click Open.

   The project opens.
3. Right-click the Fieldbus Networks icon and select Communication Settings.

   The Communication Settings window opens.
4. Under Server Context, select Remote.
5. In the Node Name field, enter >\\(Local Server name)<

   This causes communications to use the Local Server's services for configuration and monitoring.
6. Edit the project as needed.
7. When you are ready to export tags, right-click the project icon and select Export Tags.
8. Locate the TagInfo.ini file in the OLE Servers directory located on the Local Server machine.

It is important that this TagInfo.ini file is used and not the one on the remote machine, because the RS.HSEOLEServer.0 is using the local version of the OPC database. The export tags defaults to the version on the remote laptop every time. You will need to redirect the save location every time you export tags

Verify RSView Remote Access

To verify that the settings are correct, create a graphic in the Client machine, which has the RSView software installed. When you attempt to change a parameter of function block that is loaded and in operation, you should observe the following:

1. When the Remote Client attempts to connect to the Local Server, it will launch the RS HSE OLE Server and the RS DD Server, which appear in the system tray of the Local Server. The launching of these servers can be also verified by observing the appearance of RSddserver.exe and RSHseServer.exe in Task Manager (if they were not running initially).

2. When the Remote Client attempts to disconnect from the Local Server, it will stop the RS HSE OLE Server and the RS DD Server, which will be removed from the system tray of the Local Server (if they were not being actively used by the RSFieldbus Server for online monitoring).

Limitations

General Limitations

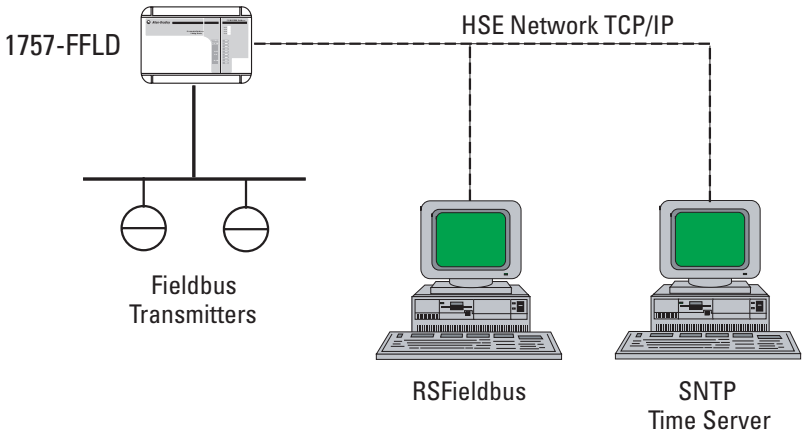
Item	Enforcement	Limit	Comment
VCR	FFLD	128 Total	16 in/16 out per H1
Function Blocks	Server	8 (no license, demo) 64, 256, 1024	Activation dependent
Devices	Server	80 or 520 (FFLD included in count)	IDShellHSE.dll dependent

Suggested Limitations

Segment Usage	Macrocycle times (mS)	Devices/H1 Segment
I/O	1000–2000	12–16
simple loop control	700–1000	6–8
fast loop control	500–700	4–5
critical loop control	300–500	2–3

RSFieldbus Time Stamping Setup

Time stamping is defined as the ability to record events in function blocks with the date and time of occurrence. Time stamping requires that devices share a coordinated system time with all other transmitters on the H1 network. This allows function blocks to record events, such as alarms and changes of state, using a common time basis. The architecture for time stamping is done using the following equipment.



The SNTP Time Server provides the system with a time source with which all Fieldbus devices can record events. The RSFieldbus Server coordinates the SNTP Time Server and the linking device using the IDShellHSE.ini file located on the server. The linking device uses the time, provided by the SNTP Time Server and directed by the RSFieldbus Server, and passes it to transmitters on the H1 network.

SNTP Server Set Up

On your SNTP server, edit the following settings to synchronize with your local time:

1. Date
2. Time
3. Time zone

The SNTP Server must be on the same subnet as the linking device.

RSFieldbus Server Set Up

1. The IDShellHSE.ini file must be edited to recognize the SNTP time server and to pass the time zone adjusted dates. The file is located in C:\Program Files\Rockwell Software\RSFieldbus\OleServers. The pertinent entries that need edited are in bold face.

StdTimeDiff=0

PriTimeSvr=0.0.0.0

SecTimeSvr=0.0.0.0

ReqTimeout=10000 ; 10 s

ReqInterval=25000 ; 25 s

TargetClass=1 ; 1 s

SchedPeriod=0

DayTimeDiff=0

StartDayTime=0

EndDayTime=0

StdTimeDiff is the actual time zone information. The parameter is measured in 1/32 ms time units. The value entered gets SUBTRACTED from GMT. So a negative value effectively adds to GMT (time zones east of GMT).

Examples:

- Eastern Time (US and Canada), which is GMT -5 hours: 576000000=(5 * 60 * 60 * 1000 * 32)
- Athens, which is GMT 2 hours: -230400000=(-2 * 60 * 60 * 1000 * 32)

PriTimeSvr is the IP address of the SNTP server. Note that you can have a secondary time server if there is a need for redundancy.

The last three entries are used if daylight savings time is in effect and you need to coordinate with it.

DayTimeDiff is the actual time zone information when daylight saving is in effect. The parameter is also measured in 1/32 ms time units. The value entered gets SUBTRACTED from GMT. So a negative value effectively adds to GMT (time zones east of GMT).

Example:

- Eastern Time (US and Canada) during daylight savings, which is GMT -4 hours, 460800000=(4 * 60 * 60 * 1000 * 32)

StartDayTime and EndDayTime define when daylight savings begins and ends. These parameters follow the mechanism that Windows uses to specify a time zone. The field is a 4 -byte structure. The first byte is the month, 2nd byte is the day of the week, 3rd is a special byte that is used to indicate on which week of the month daylight savings time occurs, and the 4th byte is the hour that daylight savings time goes into effect. For all the time zones defined in Windows that use daylight savings time, only the values 01 meaning first week of the month and 05 meaning last week of the month are used for byte 3.

Example:

- Eastern daylight savings time goes into effect the first weekend of April at 2AM on Sunday and ends on the last weekend in October at 2AM Sunday.

  StartDayTime is 0x04000102 = 04 (April) 00 (Sunday) 01 (1st weekend) 02 (2AM)

  67109122 decimal = hexadecimal notation 0x04000102 is used; StartDayTime = 67109122

  EndDayTime is 0x0a000502 = 10 (October) 00 (Sunday) 05 (last weekend) 02 (2AM)

  167773442 decimal = hexadecimal notation 0x0a000502 is used; EndDayTime =167773442.

2. Once the IDShellHSE.ini file has been edited the following actions must be completed for the coordinated time to be used by the linking device.

a. Stop the RSFieldbus services; RS HSE OLE Server and RS DD Server.
   i. Open RSServerManager
   ii. Click Disconnect.

b. In Windows Explorer, navigate to C:\Program Files\Rockwell Software\RSFieldbus\OleServers and delete the IDShellHSE.bin file. This file will be rebuilt once the services are started and RSFieldbus begins on line monitoring.

c. Start the RSFieldbus services; RS HSE OLE Server and RS DD Server.
   i. Open RSServerManager.
   ii. Click Connect.

3. Test the time stamping.
   a. Place a transmitter's RESOURCES block in and out of service; AUTO to OOS to AUTO.
   b. The TIME_STAMP sub-parameter for the BLOCK_ALM parameter should have a time stamp of when the RESOURCE block went to OOS.
   c. The TIME_STAMP sub-parameter for the UPDATE_EVT parameter should have a time stamp of when the RESOURCE block went to AUTO.

Fieldbus Status Codes for RSLogix

Input Parameters

Fieldbus Status		Logix Status - FFLD1:0:I.In[0].xxxxxx							
Quality	**Sub-status**	**Limits**	**Quality**	**Substatus**	**WindupL**	**WindupH**	**Init Primary**	**Initializing**	**Initiate Fault State**
Bad	Non-Specific	Not Limited	0	0	0	0	0	0	0
		Low Limited	0	0	1	0	0	0	0
		High Limited	0	0	0	1	0	0	0
		Constant	0	0	1	1	0	0	0
	Configuration Error	Not Limited	0	1	0	0	0	0	0
		Low Limited	0	1	1	0	0	0	0
		High Limited	0	1	0	1	0	0	0
		Constant	0	1	1	1	0	0	0
	Not Connected	Not Limited	0	2	0	0	0	0	0
		Low Limited	0	2	1	0	0	0	0
		High Limited	0	2	0	1	0	0	0
		Constant	0	2	1	1	0	0	0
	Device Failure	Not Limited	0	3	0	0	0	0	0
		Low Limited	0	3	1	0	0	0	0
		High Limited	0	3	0	1	0	0	0
		Constant	0	3	1	1	0	0	0
	Sensor Failure	Not Limited	0	4	0	0	0	0	0
		Low Limited	0	4	1	0	0	0	0
		High Limited	0	4	0	1	0	0	0
		Constant	0	4	1	1	0	0	0

Fieldbus Status		**Logix Status - FFLD1:0:I.In[0].xxxxxx**							
Quality	**Sub-status**	**Limits**	**Quality**	**Substatus**	**WindupL**	**WindupH**	**Init Primary**	**Initializing**	**Initiate Fault State**
Bad (cont.)	No Comm with last usable value	Not Limited	0	5	0	0	0	0	0
		Low Limited	0	5	1	0	0	0	0
		High Limited	0	5	0	1	0	0	0
		Constant	0	5	1	1	0	0	0
Bad	No Comm with no usable value	Not Limited	0	6	0	0	0	0	0
		Low Limited	0	6	1	0	0	0	0
		High Limited	0	6	0	1	0	0	0
		Constant	0	6	1	1	0	0	0
	Out of Service	Not Limited	0	7	0	0	0	0	0
		Low Limited	0	7	1	0	0	0	0
		High Limited	0	7	0	1	0	0	0
		Constant	0	7	1	1	0	0	0
Uncertain	Non-Specific	Not Limited	1	0	0	0	0	0	0
		Low Limited	1	0	1	0	0	0	0
		High Limited	1	0	0	1	0	0	0
		Constant	1	0	1	1	0	0	0
	Last Usable Value	Not Limited	1	1	0	0	0	0	0
		Low Limited	1	1	1	0	0	0	0
		High Limited	1	1	0	1	0	0	0
		Constant	1	1	1	1	0	0	0
	Substitute Value	Not Limited	1	2	0	0	0	0	0
		Low Limited	1	2	1	0	0	0	0
		High Limited	1	2	0	1	0	0	0
		Constant	1	2	1	1	0	0	0

Fieldbus Status		**Logix Status - FFLD1:0:I.In[0].xxxxxx**							
Quality	**Sub-status**	**Limits**	**Quality**	**Substatus**	**WindupL**	**WindupH**	**Init Primary**	**Initializing**	**Initiate Fault State**
Uncertain	Initial Value	Not Limited	1	3	0	0	0	0	0
		Low Limited	1	3	0	1	0	0	0
		High Limited	1	3	0	1	0	0	0
		Constant	1	3	1	1	0	0	0
	Sensor Conversion not Accurate	Not Limited	1	4	0	0	0	0	0
		Low Limited	1	4	1	0	0	0	0
		High Limited	1	4	0	1	0	0	0
		Constant	1	4	1	1	0	0	0
	Engineering Unit Range Violation	Not Limited	1	5	0	0	0	0	0
		Low Limited	1	5	1	0	0	0	0
		High Limited	1	5	0	1	0	0	0
		Constant	1	5	1	1	0	0	0
	Sub-normal	Not Limited	1	6	0	0	0	0	0
		Low Limited	1	6	1	0	0	0	0
		High Limited	1	6	0	1	0	0	0
		Constant	1	6	1	1	0	0	0
Good Non-Cascade	Non-Specific	Not Limited	2	0	0	0	0	0	0
		Low Limited	2	0	1	0	0	0	0
		High Limited	2	0	0	1	0	0	0
		Constant	2	0	1	1	0	0	0
	Active Block Alarm	Not Limited	2	1	0	0	0	0	0
		Low Limited	2	1	1	0	0	0	0
		High Limited	2	1	0	1	0	0	0
		Constant	2	1	1	1	0	0	0

Fieldbus Status		**Logix Status - FFLD1:0:I.In[0].xxxxxx**							
Quality	**Sub-status**	**Limits**	**Quality**	**Substatus**	**WindupL**	**WindupH**	**Init Primary**	**Initializing**	**Initiate Fault State**
Good Non-Cascade	Active Advisory Alarm	Not Limited	2	2	0	0	0	0	0
		Low Limited	2	2	1	0	0	0	0
		High Limited	2	2	0	1	0	0	0
		Constant	2	2	1	1	0	0	0
	Active Critical Alarm	Not Limited	2	3	0	0	0	0	0
		Low Limited	2	3	1	0	0	0	0
		High Limited	2	3	0	1	0	0	0
		Constant	2	3	1	1	0	0	0
	Unacknowledged Block Alarm	Not Limited	2	4	0	0	0	0	0
		Low Limited	2	4	1	0	0	0	0
		High Limited	2	4	0	1	0	0	0
		Constant	2	4	1	1	0	0	0
	Unacknowledged Advisory Alarm	Not Limited	2	5	0	0	0	0	0
		Low Limited	2	5	1	0	0	0	0
		High Limited	2	5	0	1	0	0	0
		Constant	2	5	1	1	0	0	0
	Unacknowledged Critical Alarm	Not Limited	2	6	0	0	0	0	0
		Low Limited	2	6	1	0	0	0	0
		High Limited	2	6	0	1	0	0	0
		Constant	2	6	1	1	0	0	0

Fieldbus Status		**Logix Status - FFLD1:0:I.In[0].xxxxxx**							
Quality	**Sub-status**	**Limits**	**Quality**	**Substatus**	**WindupL**	**WindupH**	**Init Primary**	**Initializing**	**Initiate Fault State**
Good Cascade	Non-Specific	Not Limited	3	0	0	0	0	0	0
		Low Limited	3	0	1	0	0	0	0
		High Limited	3	0	0	1	0	0	0
		Constant	3	0	1	1	0	0	0
	Initialization Acknowledge	Not Limited	3	1	0	0	0	1	0
		Low Limited	3	1	1	0	0	1	0
		High Limited	3	1	1	0	0	1	0
		Constant	3	1	0	1	0	1	0
	Initialization Request	Not Limited	3	2	0	0	1	0	0
		Low Limited	3	2	1	0	1	0	0
		High Limited	3	2	0	1	1	0	0
		Constant	3	2	1	1	1	0	0
	Not Invited	Not Limited	3	3	0	0	1	0	0
		Low Limited	3	3	1	0	1	0	0
		High Limited	3	3	0	1	1	0	0
		Constant	3	3	1	1	1	0	0
	Not Selected	Not Limited	3	4	0	0	1	0	0
		Low Limited	3	4	1	0	1	0	0
		High Limited	3	4	0	1	1	0	0
		Constant	3	4	1	1	1	0	0
	Local Override	Not Limited	3	6	0	0	1	0	0
		Low Limited	3	6	1	0	1	0	0
		High Limited	3	6	0	1	1	0	0
		Constant	3	6	1	1	1	0	0

Fieldbus Status		**Logix Status - FFLD1:0:I.In[0].xxxxxx**							
Quality	**Sub-status**	**Limits**	**Quality**	**Substatus**	**WindupL**	**WindupH**	**Init Primary**	**Initializing**	**Initiate Fault State**
Good Cascade	Fault State Active	Not Limited	3	7	0	0	1	0	0
		Low Limited	3	7	1	0	1	0	0
		High Limited	3	7	0	1	1	0	0
		Constant	3	7	1	1	1	0	0
	Initiate Fault State	Not Limited	3	8	0	0	0	0	1
		Low Limited	3	8	1	0	0	0	1
		High Limited	3	8	0	1	0	0	1
		Constant	3	8	1	1	0	0	1
	Do Not Select	Not Limited	3	5	0	0	1	0	0
		Low Limited	3	5	1	0	1	0	0
		High Limited	3	5	0	1	1	0	0
		Constant	3	5	1	1	1	0	0

Output Parameters

Fieldbus Status		**Logix Status - FFLD1:0:O.Out[0].xxxxxx**						
Quality	**Sub-status**	**Limits**	**WindupL**	**WindupH**	**Init Primary**	**Initializing**	**Initiate Fault State**	**Fault State**
Good Cascade	Non-Specific	Not Limited	0	0	0	0	0	0
		Low Limited	1	0	0	0	0	0
		High Limited	0	1	0	0	0	0
		Constant	1	1	0	0	0	0
	Initialization Acknowledge	Not Limited	0	0	0	1	0	0
		Low Limited	1	0	0	1	0	0
		High Limited	0	1	0	1	0	0
		Constant	1	1	0	1	0	0
	Initialization Request	Not Limited	0	0	1	0	0	0
		Low Limited	1	0	1	0	0	0
		High Limited	0	1	1	0	0	0
		Constant	1	1	1	0	0	0
	Initiate Fault State	Not Limited	0	0	0	0	1	0
		Low Limited	1	0	0	0	1	0
		High Limited	0	1	0	0	1	0
		Constant	1	1	0	0	1	0

Fieldbus Status		**Logix Status - FFLD1:0:0.AO[0].xxxxxx**						
Quality	**Sub-status**	**Limits**	**WindupL**	**WindupH**	**Init Primary**	**Initializing**	**Initiate Fault State**	**Fault State**
Bad	Non-Specific	Not Limited	0	0	0	0	0	1
		Low Limited	1	0	0	0	0	1
		High Limited	0	1	0	0	0	1
		Constant	1	1	0	0	0	1

We use these words and acronyms throughout the document.

Term	Definition
Application Layer	A layer in the communication stack containing the object dictionary.
Automation System	A process automation, control, and diagnostic system that is composed of distinct modules. These modules may be physically and functionally distributed over the plant area. The automation system contains all the modules and associated software required to accomplish the regulatory control and monitoring of a process plant. This definition of automation system excludes field instruments, remote terminal units, auxiliary systems and management information systems.
Auto Sense	Capability by the system to automatically detect and recognize any hardware upon addition to, or removal from, the system without any user intervention.
Basic Device	A device that can communicate on the fieldbus, but cannot become the LAS.
Block	See *function block*.
Block Tag	A character string name that uniquely identifies a block on a fieldbus network.
Brick	Fully connected passive junction located on the bus.
Bridge	An interface in a fieldbus network that interconnects two or more H1 networks.
Bus	An H1 fieldbus cable between a host and field devices connected to multiple segments, sometimes through the use of repeaters.
Capabilities File	Describes the communication objects in a fieldbus device. A configuration device can use Device Description (DD) Files and Capabilities Files to configure a fieldbus system without having the fieldbus devices online.
Common File Format File (CFF)	A software file used by the host to know the device detailed FF capabilities without requiring the actual device. This file format is used for Capabilities and Value files.
Communications Stack	Layered software supporting communication between devices. A Communications Stack is device communications software, which provides encoding and decoding of User Layer messages, deterministic control of message transmission, and message transfer.
Configurable	The capability to select and connect standard hardware modules to create a system; or the capability to change functionality or sizing of software functions by changing parameters without having to modify or regenerate software.
Configuration	The physical installation of hardware modules to satisfy system requirements; or the selection of software options to satisfy system requirements.
Connector	A Connector is a coupling device used to connect the wire medium to a fieldbus device or to another segment of wire.
Contained Parameter	An internal parameter that cannot be linked to other function blocks or devices (i.e., it does not have a pin).
Control Loop	A set of connections between blocks used to perform a control algorithm.
Control Strategy	*See function block.*
Coupler	A physical interface between a trunk and spur, or a trunk and a device.
Cycle	The scanning of inputs, execution of algorithms and transmission of output values to devices.

Term	Definition
Data Link Layer (DDL)	Controls transmission of messages onto the fieldbus, and manages access to the fieldbus through the Link Active Scheduler (LAS). The DLL used by FOUNDATION fieldbus is defined in IEC 61158 and ISA 50. It includes Publisher/Subscriber, Client/Server and Source/Sink services.
Device Description (DD)	Set of files (CFF, SYM and FFO) that describes the parameter capabilities of a fieldbus device.
Device ID	An identifier for a device that the manufacturer assigns. Device IDs must be unique to the device; no two devices can have the same device ID.
Device Tag	A name you assign to a fieldbus device.
Ethernet	Physical and data link layer used by HSE fieldbus.
FF	FOUNDATION Fieldbus.
Factory Acceptance Test (FAT)	The final test at the vendor's facility of the integrated system being purchased.
Fieldbus	A digital, two-way, multi-drop communication link among intelligent measurement and control devices. It serves as a Local Area Network (LAN) for advanced process control, remote input/output and high speed factory automation applications.
Fieldbus Access Sublayer (FAS)	The Fieldbus Access Sublayer (FAS) maps the Fieldbus Message Specification (FMS) onto the Data Link Layer (DLL).
Fieldbus Foundation	The organization that developed a fieldbus network specifically based upon the work and principles of the ISA/IEC standards committees.
FOUNDATION Fieldbus	The communications network that the Fieldbus Foundation created.
FFLD	Foundation Fieldbus Linking Device; an HSE node that connects either two or four H1 segments to an HSE network and to the Ethernet/IP network. The 1757-FFLD supports all H1 and HSE functionality and basic, link master, and bridge modes of operation (as specified in the FOUNDATION fieldbus Technical Overview) as well as Class 1 CIP produce/consume and Class 3 CIP server.
Function Block	A named block consisting of one or more input, output, and contained parameters. The block performs some control function as its algorithm. Function blocks are the core components with which you control a system. The Fieldbus Foundation defines standard sets of function blocks. There are ten function blocks for the most basic control and I/O functions.
H1	A two-way, digital, serial communications link that operates at 31.25 Kb.
H1 Field Device	A fieldbus device connected directly to an H1 fieldbus. Typical H1 Field Devices are valves and transmitters.
HSE	High Speed Ethernet that operates at 10/100 Mb, full-duplex communications link.
HSE Device	Any device connected directly to HSE media that contains a conformant FOUNDATION Fieldbus HSE communications stack, including a configurable Network Management Agent (NMA) (e.g., linking devices, I/O gateways, and HSE field devices).
HSE Host	Non-HSE devices capable of communicating with HSE devices (e.g., configurators and operator workstations).
HSE Linking Device	A device used to interconnect H1 fieldbus networks/segments to High Speed Ethernet (HSE) to create a larger system.

Term	Definition
HSE Switch	Standard Ethernet equipment used to interconnect multiple High Speed Ethernet (HSE) devices such as HSE Linking Devices and HSE Field Devices to form a larger HSE network.
IEC	International Electrotechnical Commission. A technical standards committee which is at the same level as the ISO.
Input Parameter	A block parameter that receives data from another block.
Interchangeability	The capability to substitute a device from one manufacturer with that of another manufacturer on a fieldbus network without loss of functionality or degree of integration.
Instantiable	The ability of a function block to create multiple-tagged function blocks of different types from a library as required by an application. Quantity per device is restricted by device memory and other resources.
Interoperability	The capability for a device from one manufacturer to interact with that of another manufacturer on a fieldbus network without loss of functionality.
IS	*Intrinsic Safety.*
ISA	International Society for Measurement and Control.
Junction Box / Quick Connection Station	Allows for quick installation of four to eight field instruments via Terminal connectors.
Link	Logical - a connection between function blocks. Physical - a connection between fieldbus devices.
Link Active Scheduler (LAS)	Executes the link schedule, circulates tokens, distributes time, probes for new devices, and removes non-responsive devices from the link.
Link Master (LM)	Any device containing Link Active Scheduler (LAS) functionality that can control communications on an H1 fieldbus Link. There must be at least one LM on an H1 Link; one of those LM devices will be elected to serve as LAS.
Link Objects	A Link Object contains information to link Function Block (FB) Input/Output (I/O) parameters in the same device and between different devices. The Link Object links directly to a Virtual Communications Relationship (VCR).
Loop	*See* control loop.
m	Prefix meaning *milli-* and has a value of 10^{-3}.
Macrocyle	Single iteration of a schedule within a device.
Methods	An optional (but highly desirable) addition to Device Descriptions (DDs). Methods are used to define/ automate procedures (such as calibration) for operation of field devices.
Mode	Control block operational condition, such as manual, automatic, or cascade.
Network	As applied in this document, is the termination of one or more fieldbus segments into an interface card of the host system.
Noise AV	Average noise in the network during the silence period between frames.
Object Dictionary	Contains all Function Block (FB), Resource Block (RB) and Transducer Block (TB) parameters used in a device. Through these parameters, the blocks may be accessed over the fieldbus network.

Term	Definition
OPC (Object Linking and Embedding for Process Control)	Software application which allows bidirectional data flow between two separate applications. These applications may be running on the same or on separate servers.
Output Parameter	A block parameter that sends data to another block.
Physical Layer	Receives messages from the Communications Stack and converts the messages into physical signals on the fieldbus transmission medium, and vice-versa.
PID	Proportional Integral Derivative.
Regulatory Control	The functions of process measurement, control algorithm execution, and final control device manipulation that provide closed loop control of a plant process.
Resource Block	Describes characteristics of the fieldbus device such as the device name, manufacturer and serial number. There is only one Resource Block (RB) in a device.
RSFieldbus	A graphical environment for creating links, loops, and schedules. You can use RSFieldbus to configure a fieldbus network and keep track of your configuration changes.
RSLogix	Software that provides a programming environment for sequential, process, drive and motion control programming. The RSLogix environment provides an IEC61131-3 compliant interface for controls programming.
s	Seconds.
Schedules	Define when Function Blocks (FBs) execute and when data and status is published on the bus.
Segment	A section of an H1 fieldbus that is terminated in its characteristic impedance. Segments can be linked by Repeaters to form a longer H1 fieldbus. Each Segment can include up to 32 H1 devices.
Splice	An H1 Spur measuring less than 1 m (3.28 ft.) in length.
Spur	An H1 branch line connecting to the Trunk that is a final circuit. A Spur can vary in length from 1 m (3.28 ft.) to 120 m (394 ft.).
Standard Function Block (FB)	Blocks built into fieldbus devices as needed to achieve the desired control functionality. Automation functions provided by Standard FBs include Analog Input (AI), Analog Output (AO) and Proportional/Integral/Derivative (PID) control. The Fieldbus Foundation has released specifications for 21 types of Standard FBs. There can be many types of FBs in a device. The order and definition of Standard FB parameters are fixed and defined by the specifications.
Tag	A collection of attributes that specify either a control loop or a process variable, or a measured input, or a calculated value, or some combination of these, and all associated control and output algorithms. Each tag is unique.
Tag Id	The unique alphanumeric code assigned to inputs, outputs, equipment items, and control blocks. The Tag Id might include the plant area identifier.
Terminator	Impedance-matching module used at or near each end of a transmission line that has the same characteristic impedance of the line. Terminators are used to minimize signal distortion, which can cause data errors by converting between current variations and voltage variations. H1 terminators also convert the current signal transmitted by one device to a voltage signal that can be received by all devices on the network.
Topology	Shape and design of the fieldbus network (for example, tree branch, daisy chain, point-to-point, bus with spurs, etc.).

Term	Definition
Transducer Block (TB)	Decouples Function Blocks (FBs) from the local Input/Output (I/O) functions required to read sensors and command output hardware. Transducer Blocks (TBs) contain information such as calibration date and sensor type. There is usually one TB channel for each input or output of a Function Block (FB).
Transmitter	An active fieldbus device containing circuitry, which applies a digital signal on the bus.
Trunk	The main communication highway between devices on an H1 fieldbus network. The Trunk acts as a source of main supply to Spurs on the network.
Virtual Communication Relationship (VCR)	Configured application layer channels that provide for the transfer of data between applications. FOUNDATION fieldbus describes three types of VCRs: Publisher/ Subscriber, client/Server, and Source/Sink.

Notes

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

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